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Editorial Notes

"Open Firegrate" Cokes

A GREAT deal is said these days about the desirability of the Gas Industry's producing a free-burning coke suitable for use in the "ordinary" open firegrate, and of recent years much experimental work has been directed towards this end both by the Gas Industry and by the Fuel Research Board. At Liverpool, of course, "Dryco" has been marketed by the Liverpool Gas Company for some years, and this fuel is satisfactory in the "ordinary" firegrate. Sales of "Dryco," which is produced from selected coals under conditions less severe than usual in vertical retorts, increased from 3,000 tons per annum in 1931 to 17,000 tons in 1937. We have had the work carried out at the Fuel Research Station on the production of free-burning coke in chamber ovens at temperatures intermediate between those of high-temperature and low-temperature carbonization. The results were presented by Captain Fraser Shaw and Dr. King at the meeting of the Institution in June of 1934. Then, in November last we had the results, given in the Institution Paper by Mr. Jamieson and Dr. King, of co-operative work between the Edinburgh Gas Department and the Fuel Research Station on the production of free-burning coke in continuous vertical retorts using the plant and methods of gas manufacture.

Referring to the Edinburgh work, the latest Fuel Research Report states that satisfactory smokeless fuels can be made in gas retorts from selected sized coals and that the economic success of the method would depend upon the price realized for the smokeless fuel. But it goes on to say: "Suitable coals should not be difficult to find; they are available in the coalfields of Scotland, Northumberland, and the South Midlands. The manufacture of smokeless fuels could be made the function of stand-by plant, or during periods when the demand for gas is low, but in either case *the higher price obtainable for the fuel would balance the higher coal cost and allow the production of gas at the same price per therm.*" The italics are ours, for this is a very sweeping statement.

It will be agreed that solid smokeless fuel satisfactory in use in the "ordinary" open firegrate can be manufactured quite easily by the Gas Industry, and there can be nothing but praise for the excellent investigational work which has been undertaken in this direction, but it will also be agreed that this special fuel cannot be produced at the price of gas coke. And we would ask in all seriousness, What is an "ordinary" open firegrate? We are constantly hearing and reading this term "ordinary." The construction of coal-burning grates differs largely from type to type. When, for example, we turn to the Paper given to the Institution last November by Dr. Davidson and Dr. Hartley, we find that, in the description of the open grates used for tests of solid fuels for heating living rooms, coal grate No. 1 was of usual design having a stool bottom grate and loose front fret with air slide; sunken fire No. 1 had a cast-iron bottom, the outside frame of which was cemented into the hearth, a flue block with ribs and ventilation channels being fitted to induce draught through the fuel bed; sunken fire No. 2 was of usual construction made wholly in firebrick, the bottom being in three pieces and dished, no ribs being provided.

Is the Gas Industry's aim, then, to manufacture solid smokeless fuel which will burn satisfactorily in all the various types of "ordinary" coal grate, or is it to encourage the installation and use of the open coke grate, which is a thoroughly efficient piece of household equipment, clean, and convenient, and which cannot be surpassed for economy? Why should there be any objection to the "special grate" idea? In the early days of the Gas Industry it was common for a gas burner to be inserted, almost apologetically, in an oven designed for being heated by raw coal. Then came the specially designed gas cooker, and it met with public acceptance on its merits. We are of opinion that if the Gas Industry got down to it in earnest the open coke grate would meet with much more general public acceptance, the air of our towns and cities would be clearer, and the Gas Industry's position as fuel supplier more secure. The special coke grate could provide a solution to the problem of smoke reduction and a solution, too, to the problem of finding a permanent remunerative market for coke.

Benzole Recovery

WHETHER or not benzole recovery is practised it is sound gas-making economics to ensure a good coke market. With benzole recovery and a good coke market gas can be made more cheaply. This we clearly demonstrated in the "JOURNAL" for Dec. 14 last, when we expressed concern at the Industry's weak attitude in regard to the coke market. Any well-organized business concern, given such an excellent commodity as gas coke, would have found means of selling it.

The Gas Industry, however, has, speaking generally, exhibited little enthusiasm in one of its major assets, and the extent of its lethargy in this direction is also a measure of its disservice to the nation. The people want warmth which they can afford. The public conscience is being awakened to the evils of smoke. The Gas Industry can offer smokeless homes, with a fuel service of gas and coke, to all and sundry; and the fears which have been expressed to us about a weakening of the coke market seem passing strange to us. The Gas Industry's apathy towards coke is shown by the absurdly small amount of money spent in advertising its merits and its economy, by lack of enterprise in featuring it in showroom displays. Yet if the Industry wants to sell cheap gas and to make possible a great extension of the all-gas idea, it must look after the coke market. It has been computed that, on a thermal basis per head of population in this country, 25 therms of gas are used, 51 therms of coke, 11 of anthracite, 1 of electricity—*but 240 therms of coal.* Translating these figures into useful heat per head of population we have gas 19%, coke 19%, anthracite 4%, electricity 1%—*but coal 53%*. It would, we suggest, be well to bear these figures in mind.

In the "JOURNAL" for Dec. 14 we expressed the opinion that the influence benzole recovery has on the price at which the gaseous therm can be made is insufficiently appreciated; and we attempted to show what the Gas Industry is missing if it cannot dispose of the extra coke consequent on benzole recovery. It is losing heavily; and we pointed out that profitable benzole recovery is not confined to the large or even medium-sized works. We mentioned, but did not stress, the importance of benzole recovery from the point of view of national welfare. This aspect was, however, emphasized by Mr. S. E. Whitehead, an acknowledged authority on benzole recovery, in a letter published in the "JOURNAL" the following week. Having commended our analysis of the economics of benzole recovery, Mr. Whitehead went on to say: "During the European War the great need was first for toluole and later for benzole . . . and the Gas Industry played an important part in supplying these needs. In those days, however, although the recovery of crude benzole was a less profitable business than it is at present, the difficulty was not to find gas engineers who were willing to strip their gas, but to procure the plant necessary for them to do so. With benzole recovery showing an attractive profit, it is unthinkable that we should risk a repetition of that position. . . . I submit, therefore, that it is the clear duty of every gas undertaking to consider this matter most seriously, and unless there are abnormal circumstances to erect plant for the recovery of the maximum quantity of crude benzole in time of emergency. If, as we all fervently hope, that emergency does not arrive, the rate of recovery can be adjusted to suit the circumstances of the undertaking and the balance-sheet of the process. The latter will (as indicated in your article) be favourable even at partial load."

Then, in our issue last week, we published a New Year message from Mr. Albert Hittinger, who, speaking for the British benzole industry, expressed the hope that there would be a favourable response by potential producers, particularly gas undertakings, to the call for increased supplies of motor spirit. "Last year," he said, "has seen many gas-works joining the ranks of benzole producers, but there is still room for considerable development in the production of benzole at gas-works." By recovering benzole the Gas Industry can render an important service to the nation. Benzole recovery implies the manufacture of more coke. In selling this coke —and we are convinced that with determination and enthusiasm this excellent solid smokeless fuel *can* be sold—the Industry will also be rendering an important national service in lightening the work and enhancing the health of the community.

Research on Coal

IN a friendly letter published in our columns to-day Captain J. G. Bennett, Director of the British Coal Utilisation Research Association, comments on our recent editorial dealing with the Association's activities and their likely influence on the progress of the Gas Industry. We suggested that the work of the B.C.U.R.A. will tend to retard the advent of the smokeless age. Captain Bennett expresses the hope that the contrary will be the outcome, and remarks that if the economics of total gasification ever permit the widespread substitution of solid fuel by gas without increasing the cost of heat to the consumer he would welcome it as warmly as any member of the Gas Industry. He also remarks that industrial research must work for the immediate as well as the more distant future. While naturally agreeing with this broad premise we still think that the work of the B.C.U.R.A. is calculated to perpetuate the burning of raw coal, and that any research directed to any increase in this wasteful practice is not in the nation's best interests. Research has resulted in the development of coal-burning appliances which produce less smoke than formerly, but they are a compromise and not the ideal solution of the smoke problem.

If there were no economic alternative to the use of raw coal then we should have no criticism to offer of research aimed at the development of coal-burning appliances designed to reduce, if not abolish, the smoke evil. Looked at purely from the raw coal angle, everything is to be said for the research, and, as we have observed before in these columns, the new coal utilization research organization is admirably planned. Our point, however, is that right at hand lies the alternative to raw coal in the use of gas and coke—a proved and thoroughly economic alternative; an alternative which reduces labour, brings convenience, promotes health, and rids the air of smoke. Gas and coke are within the means of every section of the community. Their manufacture is accompanied by the production of other valuable materials, particularly tar and benzole. The manner in which the Gas Industry processes coal is highly economic and definitely in the national interest. Captain Bennett speaks of the enormous amount of raw coal which is burned annually in this country. It is quite unnecessarily enormous, and it is not to our mind a far-sighted policy to attempt to retard its replacement by gas and coke.

A Case of Corrosion

A PAPER of great interest on a specific case of serious corrosion was presented by Mr. G. Dougill, of the Gas Light and Coke Company, at the last meeting of the London and Southern District Junior Gas Association. It will be found on later pages of our issue to-day. The trouble arose at the active carbon plant for benzole recovery at Beckton. In this process the bed of active carbon is heated during benzole distillation by steam coils. At the end of the distillation period the same coils are used to circulate cooling water to cool the carbon and to absorb the latent heat of the adsorbed benzole. The corrosion of these coils set in after two months' working of the plant; and as the cost of a set of coils for one adsorber was £600, considerable expense in in-

vestigating the cause was justified. The systematic way in which the problem was tackled was admirable, and Mr. Dougill's account of the steps taken in the investigation, which resulted in a cure of the trouble, makes good reading. The trouble was not cured by merely removing dissolved oxygen from the water. The corrosion was stopped by removing the intense local driving force which consisted of an electrolytic cell formed by part of the iron being in contact with two layers of water of dissimilar condition. The upper layer contained no dissolved oxygen and no sodium chloride, while the lower contained dissolved oxygen and sodium chloride. By making the condensed steam and residual water identical the corrosion was stopped. In gas-works there are many applications of the differential aeration theory of rusting, and the work dealt with by Mr. Dougill should be of assistance to others and help them to cure some of their troubles.

Fuel Research

THE recently issued Report of the Fuel Research Board gives indication of the very greatly extended scope of the work undertaken by the Board and the very large measure of co-operation which has been built up, particularly of recent years, between the Board and other technical bodies and institutions. In the 255 pages of the present report—42 more than the previous one—there is ample evidence of the close collaboration of the Gas Industry and the F.R.B., very welcome collaboration and a cause for lively satisfaction. More and more is the Board, with its highly developed organization and outstanding facilities for research, helping the Industry in immediate and also long-term problems. This help has yielded a crop of exceedingly useful results, as the Transactions of The Institution of Gas Engineers show, and the future of this collaborative work is full of promise. The Gas Industry is wise in fostering it.

The Paper by Mr. Jamieson and Dr. King at the Research Meeting of the Institution last November proved the great utility of the Fuel Research Station survey records in the selection of suitable coals for the production of free-burning coke in continuous vertical retorts. Doubts as to the utility of the survey and its methods, expressed in many quarters at its inception, have been dissipated, but we do think that a keener interest should be displayed in this survey—work of great national importance—and greater advantage taken of the volume of valuable information already gained by this systematic investigation. The organization was put actively to work in 1922. It started in co-operation with the Lancashire and Cheshire Coal Research Association. Since then further laboratories have been established in eight of the main coal-producing areas. The survey now covers, with a few minor exceptions, all the coalfields of this country. Taking an average of the periods for which the survey has been operating in the different areas, the organization has been working for the equivalent of 7½ years. It is estimated that during this period the amount of coal systematically covered by the survey is 30,000 million tons. Such progress has been made that it is now possible in many cases to plot on maps "contour" lines showing the variations that occur in the volatile matter, the sulphur content, and other properties of the seam as it extends over the coalfield. In regard to methods of analysis of coal and coke, these have been revised and enlarged; additions include methods for the determination of chlorine, arsenic, and other forms of sulphur in coal.

Very interesting are the references in the report to the "weathering" of coal on storage. Experiments at the Fuel Research Station suggest that any serious loss of caking properties during storage is associated with spontaneous heating, and that only in large dumps, where heat generated by oxidation is not readily dissipated, does appreciable loss in caking properties occur. The experiments at the Granton Works of the Edinburgh Corporation Gas Department, begun over four years ago, have now been completed, and the results are to be presented in a Paper to the Institution. It is observed in the report, however, that coals having an agglutinating value below 15 have an insufficient reserve of caking power to withstand a prolonged period of storage, whereas coals of higher agglutinating value may lose caking power and still be able to produce a satisfactory coke. The decrease in caking power adversely affected the performance of the coals in continuous vertical retorts "In Scotland," it is stated, "where the caking power of native coals tends to be low, the storage, for ultimate carbonization purposes, of coals having agglutinating values nearer the lower limit for such coals is unwise. The fall in caking power may be sufficient to alter operating conditions profoundly and to entail considerable loss in the value of the products." This point is, of course, of great importance in that collieries are pressing gas undertakings to take regular deliveries, which not only necessitates the carrying of heavy stocks but also involves additional handling charges.

Dustproofing of Coal

IN several papers published in American journals claims have been made to the effect that "dustproofing" of coal results in improved combustion properties, improved weathering of graded sizes, and reduced loss of caking properties during storage. The Fuel Research Station has carried out experiments on dustproofing, but has found little evidence in support of these claims. Most of the results on treated and untreated coals show no change whatever apart from normal experimental fluctuations.

It is unnecessary for us to dwell on that part of the report dealing with the work of the Fuel Research Station in collaboration with the Gas Industry—notably the Edinburgh Gas Department. Progress reports and papers on most aspects of this work have already appeared in the "JOURNAL"; and we shall, of course, keep our readers fully informed of developments as they take place. We would call attention, however, to the programme of research which has been arranged by the Fuel Research Board Committee on Coke Ovens, the membership of which includes the Chairmen of the Coke Research Committees and the Director and Technical Director of the British Iron and Steel Federation. This research will make use of facilities offered by the managements of a number of coke oven plants, and it is to occupy a long period of time. In the first instance a series of experiments is to be carried out to determine the effect of the type of oven on the properties of the coke produced and also the effect of the type of coal used. Facilities have been arranged for carbonizing selected coals in ovens varying from 12 in. to 21 in. in width. Later, the nature of the by-products will be studied.

In regard to hydrogenation, it has been found that vertical retort tar forms a suitable raw material for the hydrogenation process, being only slightly inferior to low temperature tar for this purpose. In another direction work has been carried out on the desulphurization of crude benzole by means of a mild hydrogen treatment. The high pressures normally used in the hydrogenation process are not necessary

for this purpose; benzole can be desulphurized and refined at a pressure of 20 atmospheres, a temperature of 350° C., and at a high rate of throughput.

We have touched upon a few only of the hundred and one matters dealt with in the Fuel Research Board Report. It is a document which we feel sure will be studied with pleasure and profit by the personnel of the Gas Industry and it will, as we have said, convince all of the need for and the value of co-operative work.

"Twilight"

A baby boy "has been named 'Twilight' by nurses at the hospital." This is a statement made by a popular newspaper a few days ago. It is a picturesque name; but upon this occasion called forth by anything but a picturesque episode. In fact, many of our very good friends on the "opposition benches" will doubtless hope that the name will not "stick," for if it does curiosity will certainly from time to time compel explanation by the bearer of it, and the explanation must be one that carries its lesson, though unfortunately it relates to a state of affairs that of late has been less rare than could have been wished. However, by the time "Twilight" is old enough to make his explanation to enquiring friends, the lesson may have been learnt. Here are the facts as reported by the newspaper already referred to: "By the light of torches and candles a baby was born at Blackpool during an electricity failure. Several Lancashire towns were 'plunged into darkness.' . . . Two surgeons were operating to remove a woman's appendix in Fleetwood Hospital when the light failed. Emergency lighting apparatus was hurriedly brought into use, and by the light of three small bulbs connected to a 12-volt battery the operation was completed. A nurse then stitched the incision by the light of an ordinary pocket electric torch." The cause? A cable breakdown and fire. An accident, of course. But nevertheless "Twilight" carries a lesson in his name.

Cold Spells Make History

A cold spell such as was experienced at Christmas has one unvarying effect—it brings out the records like a rash over the face of the national Press. Normally sane editors rush into print with the information that it hasn't been so cold on the roof of the Air Ministry or in Kew Gardens, or other unlikely places, since Napoleon's flight from Moscow. Registered readers argue vociferously with each other as to when the ice was last thick enough for them to skate on Wapping Creek. Experts give useful but wholly belated advice on how to avoid burst pipes (personally, we found the chief difficulty was getting at them)—while public utility undertakings show the biggest outputs ever.

Cold weather is news to the Gas Industry, and there were few undertakings which did not make their own history at Christmas time 1938. News because, thanks to the publicity service of the B.C.G.A., there were few papers of importance—local or national—which did not comment upon how the Gas Industry met an unprecedented demand. True, there was often included in the same item similar information regarding the output of the local electricity concern; but then, not infrequently, the gilt lay less thickly on their gingerbread as a result of the accompanying announcement that there had been a slight (or considerable) "intermission" in the supply of current due to the suddenly increased load or to some prank of Jack Frost on the distribution system. Electrical undertakings doubtless learned that underground transmission has much to recommend it in times like these.

The Gas Industry's Part

To the Gas Industry it is all good publicity—even when the earnest young lay reporter sails blithely into a description of the gas-making process, with breath-taking pictures of retort houses where "the coal is baked in huge ovens" or "gasified by coke furnaces under tubes." After all, one must be prepared to believe almost anything in such circumstances—not forgetting the "chief engineer" who spent Sunday morning on the task of punching holes in old buckets. This, apparently, was an ingenious method of providing braziers with which to thaw out various portions of his works.

As to the actual figures, it was stated that during the six days ended on Thursday, Dec. 22, the amount of gas sent out in Great Britain showed an increase of 2,000 million cu.ft. compared with the previous six days, while the largest single day's output reached 1,500 millions—a record in the history of the Industry. The amount of coal required to produce the increase alone is estimated to provide work for 25,000 miners for one week. Many undertakings showed increases of 30% and more during the period. Such are the figures which put the Gas Industry in the news; but a good deal more lay behind these bare statistics. For instance, the story of the engineers and their assistants who spent much of the holiday season on the works in order to cope with the enormous demand; of the precautions hastily taken to prevent snow and ice damage to vital pieces of plant; of valiant efforts to supply coke to large numbers of people who suddenly found themselves running short; and of assiduous service on the district to ensure the maintenance of supply and the proper operation of all appliances under exceptional conditions. And in not a few instances gas provided an emergency service when other means had failed or broken down.

As a result, the story everywhere had the same happy ending—"The Gas Undertaking Was Able to Meet All Demands." A simple statement; but it carries a wealth of meaning.

Forthcoming Engagements

January.

12.—G.C.P.A.—Committee Meeting, 2.30 p.m.
12.—Midland Juniors.—Lecture by A. T. Green, F.I.C., of the British Refractory Research Association.
14.—Scottish Western Juniors.—Visit to Maxol Heaters, Ltd., Manchester.
14.—Yorkshire Juniors.—Paper by H. A. Fells, of Sheffield.
16.—L.C.C.A.—At Gas Industry House. Finance Committee, 10.45 a.m.; Executive Committee, 11.15 a.m.; Central Committee, 2.30 p.m. [*Not Jan.* 19 *as stated in last week's* "JOURNAL."]
16.—W.G.C.—Training Committee, 11 a.m.; Executive Committee, 2.30 p.m.; Summer School Committee, 4.30 p.m.; London and Home Counties Demonstrators' Circle, 7 p.m.
17.—B.C.G.A.—Gas Industry House. Executive Committee, 11.30 a.m.; General Committee, 2.30 p.m.
17.—I.G.E.—Gas Education Executive Committee, 2.30 p.m.
17.—London and Southern Juniors.—Meeting at Kennington. Paper by G. S. J. Knott on "Meters and Standards."
18.—I.G.E.—Domestic Heating Committee, 2.30 p.m.
19.—S.B.G.I.—Council Meeting, 2.30 p.m.
20.—S.A.G.E.M. (Western District).—Commercial Meeting, Rougemont Hotel, Exeter, 2.30 p.m.
21.—Wales and Monmouthshire Juniors.—Meeting at Newport.
21.—Western Juniors.—Visit to Cheltenham. Paper by Leopold Friedman, of Ascot Gas Water Heaters, Ltd.
24.—I.G.E.—Refractory Materials Joint Committee, 2.30 p.m.
25.—I.G.E.—Pipes Committee at Birmingham, 2.30 p.m.
25.—Southern Association (Eastern District).—Meeting at Gas Industry House, 2.30 p.m. Discussion on "The Operation of a Reconstructed Works."
28.—Scottish Western Juniors.—Visit to Parkinson & Cowan, Ltd., Glasgow.
31.—I.G.E.—Joint Committee on Complete Gasification under Pressure, Department of Scientific an Industrial Research Offices, 16, Old Queen Street, S.W. 1, 3 p.m.

February.

1.—London and Southern Juniors.—Visit to Cricklewood Works of British Oxygen Company.
1.—Manchester and District Juniors.—Visit to Staveley Coal and Iron Company, Ltd., Chesterfield.
2.—Midland Juniors.—Paper by F. A. Reynolds, "Some of the Uses for Gas at Wolverhampton."
4.—Scottish Eastern Juniors.—Visit to Messrs. William Dixon's Coke Oven Plant, Govan Ironworks.
7.—I.G.E.—Research Executive Committee, 2.30 p.m.
11.—Scottish Western Juniors.—Paper by D. Beavis, of Helensburgh, on "The Modern Domestic Field."
14.—I.G.E.—Finance Committee, 10 a.m.; Membership Committee, 11 a.m.
14.—London and Southern Juniors.—Paper by A. Ronca on the 1937 Factory Act (at the H.O. Industrial Museum).
14.—N.G.C.—Central Executive Board, 2.30 p.m.
18.—Scottish Western Juniors.—Annual Whist Drive and Dance.

Personal

In the New Year's Honours List appeared the names of Dr. J. D. POLLOCK, President of the British Oxygen Company, who has been created a Baronet, and of Captain T. A. BRADFORD, D.S.O., a Director of the City of Durham Gas Company, who has been created a Knight.

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On Sunday, Jan. 1, an interesting ceremony took place at Upperton Congregational Church, Eastbourne, when the Rev. Harry Ingham, D.D., dedicated a beautiful carved oak lectern "To the Glory of God and in loving and grateful memory of the late Mr. and Mrs. JAMES STEPHEN GARRARD."

Mr. and Mrs. Garrard were widely known and affectionately remembered, as evidenced by the large congregation which attended the ceremony. Mr. Garrard's service to the Gas Industry extended over half a century, and in succession he held appointments at Ipswich, Cheltenham, and Eastbourne, where he was Secretary to Eastbourne Gas Company 1902-1930. He also served for many years on the National Gas Council and on the Committee of the B.C.G.A.

An added interest is given to the event by the fact that the lectern was designed and executed by Mr. Garrard's third son, C. Godfrey Garrard, who is widely known for the beauty and high quality of his ecclesiastical work.

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Sir FRANK E. SMITH, G.B.E., K.C.B., D.Sc., LL.D., F.R.S., will relinquish on Jan. 31 his appointment as Secretary to the Committee of the Privy Council for Scientific and Industrial Research. The King has been graciously pleased to approve the appointment of Professor E. V. APPLETON, D.Sc., LL.D., F.R.S., to succeed Sir Frank Smith. Professor Appleton is at present Jacksonian Professor of Natural Philosophy in the University of Cambridge and Fellow of St. John's College, Cambridge, and will take up his new appointment on Feb. 1.

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Mr. ALAN R. C. JOHNSTON has been elected a Director of Messrs. William Edgar & Son, Ltd., of Hammersmith, and will now act as Assistant Managing Director to the Chairman and Managing Director, Mr. Ronald Edgar.

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At Blenheim Works on Dec. 23, Mr. CHARLES INGLISH BARNES was presented by Mr. Ronald Edgar with a gold watch, on the occasion of his retirement on pension after forty-three years' service with Edgars. The Staff and employees gave him a wireless set, and we are sure that "Charlie" Barnes takes with him also the sincere good wishes, not only of his colleagues, but of a host of old friends throughout the Industry.

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The Directors of the Rushden and Higham Ferrers District Gas Company have appointed Mr. THOMAS WATSON Engineer and Manager as from Jan. 1. He has held the position of acting Engineer and Manager since the death of Mr. A. T. Watson in June last. Mr. Watson received his training as a Mechanical Engineer in the Great Western Railway Locomotive Works at Swindon. Subsequently he spent five years with West's Gas Improvement Company, Manchester, in their drawing office and in charge of outside erection. Then followed a short period with the English Electric Company, at Stafford, from whom he went to the Woodall-Duckham Company, again in charge of erection of vertical retort installations. He left that Company in October, 1936, upon his appointment as Assistant Engineer and Manager at Rushden. He is the third generation of his family to hold this appointment. Mr. Watson is an Associate Member of the Institution of Mechanical Engineers and of The Institution of Gas Engineers.

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After 43 years in the service of the Gas Light and Coke Company, Mr. J. E. HENWOOD has retired from the Gas Sales Department.

Obituary

John T. Dunn, D.Sc., F.I.C.

It is with regret that we announce the death at the age of eighty of Dr. John T. Dunn on Jan. 3. He was President of the North of England Gas Managers' Association during the session 1937-38. He was senior partner of the firm of J. & H. S. Pattinson, Analytical and Consulting Chemists, of Newcastle-on-Tyne. Born in 1858, he obtained the degree of D.Sc. in 1888. At that time he was Headmaster of Gateshead School, whence he was appointed to a similar position at the Plymouth Technical School in 1894. The following year he became Principal of the Northern Polytechnic. Dr. Dunn, who was Public Analyst for Northumberland, Newcastle-upon-Tyne, Gateshead, Sunderland, South Shields, Tynemouth, and Berwick-on-Tweed, served on the Councils of the Society of Chemical Industry, the Institute of Chemistry, and the Society of Public Analysts, having been President of the first-named in 1933-34.

Letters to the Editor

Coal Utilization Research

SIR,—Your Editorial of Dec. 21 is so complimentary that it would ill become me to find fault with anything you say. I hope, however, you will allow me to make it clear that the B.C.U.R.A. has not been conceived in any spirit of opposition to the use of gas. You say that you have no doubt that our work "will tend to retard the advent of the smokeless age," whereas I hope that just the contrary will be the case. This may well be achieved with solid fuel by the general adoption of flue gas washing, but if the economics of total gasification ever permit the widespread substitution of solid fuel by gas without increasing the cost of heat to the consumer, I personally shall welcome it as warmly as any member of the Gas Industry.

Industrial research must work for the immediate, as well as the more distant, future, and at the present moment 94% by weight of the coal used in this country is burned in solid form either as raw coal or as coke, while the remaining 6% covers gas, tar, and all other products. Even the most ardent reformer can hardly expect to see the proportions reversed within the next two decades. Not a small part of the 94% consists of carbonized fuels, and in striving to promote their better utilization we have complete identity of interest with the carbonization industries. I feel strongly that, in this community of interest, there is a bridge over which much valuable traffic can pass.

However tempting it may be for the Gas Industry to develop coke research entirely within its own orbit, I hope that its far-sighted leaders will reserve some of their interest and support for co-operation with us in this field. Quite apart from coke research, we contemplate in one of our major researches studying the combustion of town gas parallel with that of pulverized coal.

By all means let the Gas Industry, "by modern selling methods," continue "to make effective reply" to rival fuels, but in the field of research let us remember that our community of immediate interest, and indeed of ultimate aim, entirely outweighs any conflict in view-point.

Yours, &c.,
J. G. BENNETT, Director,
The British Coal Utilisation Research Association.

Jan. 5, 1939.

"You Have Been Warned"

SIR,—I note, in the exceedingly interesting article "You Have Been Warned," in your issue of Jan. 4, a reference to the Paper that I read at the Fourth National Coal Convention; and as the passage from my Paper was not quite correctly given by the contemporary from which you quoted, perhaps you will allow me to re-state what I actually did say. This was that, "according to the *Gas Times*, 'there is a big field between the net cost of coal at 1½d. per therm and a selling price of 9d. or 10d. a therm in which to exercise economies.'"

You will find the passage in the printed Papers issued to delegates at the Convention and circulated to the Press, and also in the *Coal Merchant and Shipper* of Nov. 26, 1938, on p. 574.

Yours, &c.,
Jan. 5, 1939. H. J. GILLESPIE.

Protection of Service Pipes

SIR,—The account in last week's "JOURNAL" of some work by the Chemical Department of the South Metropolitan Gas Company on protection of service pipes against internal corrosion is of interest to me, as it enlarges some of the experiments which are recorded in my Paper published in the British Junior Gas Association's Transactions, Vol. XXIV., pp. 161-162.

The observations on material (*a*) appear to differ from my own in this respect. A period of about 2 months elapsed before this material became crinkled.

I found that pieces of tube coated with this material, and which had been allowed to dry and harden for periods of from 15 days to 6 weeks, would become crinkled on exposure to gas saturated with water vapour and containing benzole in 24-48 hours.

Samples of tube subject to the gas, after drying and naphthalene washing, not benzole removal, were quite unaffected after 6 weeks' exposure. This leads one to query the statement in the account: "This offers some difficulties . . . softening the paint, and in many cases dislodging it from the metal surface."

Only when saturated gas has regular access to linseed oil or red oxide paints does it allow particles of paint to be carried forward.

The proof of the greater value of bakelite resin paints for prevention of internal corrosion should interest gas engineers, as it finds a new use for one of the Industry's tar products.

Yours, &c.,
K. LAMPHIER CLARK, Chief Chemist.
Weston-super-Mare and District Gas Company,
Jan. 9, 1939.

News of the Week

The Calorific Value of gas supplied by the East Retford Gas Department as and from April 1 will be 475 B.Th.U. per cu.ft. gross.

With Respect to Smoke Abatement the Esher Urban District Council give notice in the *London Gazette* for Jan. 6 of their intention to apply to the Minister of Health for confirmation of a by-law made by the Council.

In Connexion with A.R.P., the Birkenhead Gas Engineer, Mr. J. Hood, has reported upon an interview he had together with the Wallasey Gas Engineer, Mr. H. B. Holliday, with representatives of the Home Office in regard to providing inter-communication between the gas mains of Birkenhead and Wallasey.

An Increase in the Price of Gas by 3d. per 1,000 cu.ft. is recommended by the Lincoln Gas Committee. The price of industrial gas has already been increased from 1s. 3d. per 1,000 cu.ft. to 1s. 7d. per 1,000 cu.ft., and the Gas Committee now recommends that the other items in the graded scale of charges be increased by 3d. per 1,000 cu.ft. as and from Jan. 1.

Sanction for a Loan has been received by the Lincoln Gas Department from the Ministry of Health for a new 3 million cu.ft. gasholder. Messrs. Newton, Chambers, & Co., Ltd., are the successful contractors. It is also interesting to note that the Department achieved a record output of gas on Dec. 20, when 3,253,000 cu.ft. were consumed in the twenty-four hours.

"Gas Traction" is the subject of a Paper which will be presented to the Graduates' Section of the Midland Branch of the Institution of Mechanical Engineers by Dr. C. M. Walter, of the Birmingham Gas Department, at the James Watt Memorial Institute, Great Charles Street, Birmingham, on Jan. 25, at 7.15 p.m. During the evening a gas-operated vehicle will be available for inspection and described subsequently in detail by Dr. Walter.

Domestic Gas Lighting was recently discussed at a meeting of the Hereford Town Council. In seconding the Gas-Works and Lighting Committee report last week, Mr. Wright referred to a decision of the Gas Committee that the Gas Engineer and General Manager, Mr. A. Roberts, report to a future meeting on the question of domestic lighting and the lighting of shops and public buildings by gas. He said this was with a view to popularizing the use of gas, particularly in shops with a new system of burners and also to impress upon them that gas was the most reliable light. He said just before Christmas quite a number of shops were without electric lighting for a time and had to resort to candles.

New Showrooms for Southport were discussed at the monthly meeting of the Southport Town Council on Jan. 3. Councillor W. Lea, in moving the minutes of the Gas Committee of which he is Chairman, called attention to the fact that the Gas Committee had approved a report of the Gas Sub-Committee regarding accommodation for the Gas Department at the Old Market site, Eastbank Street, with the addition that the Sub-Committee be authorized to negotiate for the sub-letting of such part of the ground floor of the new building as may not be required for the purposes of the Gas Department. Councillor Lea, speaking in justification of the scheme, said the manufacture of gas had been increased from 850 million cu.ft. in 1930 to 931 million cu.ft. in 1938. The minutes were approved.

Over the Eight Days from Dec. 19 to 26 inclusive the Isle of Thanet Gas Light and Coke Company supplied over 2 million cu.ft. of gas per day, and on three of these days (Dec. 23, 24, and 25) the output reached a daily total of over 2¼ million cu.ft., the maximum being achieved on Christmas Eve, when 2,586,000 cu.ft. were sold. The previous Christmas Eve record, created three years ago, was 2,113,000 cu.ft. The latest figures represent an increase of 22·3% on that amount. During the week Dec. 17-24, 15,100,000 cu.ft. were delivered; this amount was 46% greater than the previous week. The three-hours' output from 11 a.m. to 2 p.m. on Christmas Day was no less than 679,000 cu.ft., as against a previous record of 591,000 cu.ft. over a corresponding period. It is also worthy of note that during the cold spell the pressure at the extreme end of the Company's area did not fall below 24-tenths.

On Christmas Day the Guernsey Gas Light Company sent out 1,154,000 cu.ft., against 923,300 cu.ft. for the same day in 1937, an increase of 230,700 cu.ft. This constitutes a record in the 108 years' existence of the Company, the previous best day's output being 952,600 cu.ft.

Increased Charges for Gas for smaller consumers have been decided upon by the Blackpool Town Council. These range from 2s. 7½d. per 1,000 cu.ft. to 3s., and from 2s. 5½d. to 2s. 7½d., concerning respectively users of gas with meters up to and including 45 therms per quarter and those with meters from 45 therms to 225 therms per quarter. Users of larger meters will not be affected.

Faced with Extra Coal Costs, Burnley Gas Department is anticipating a loss on the current year's working. The question of charges was discussed at the last meeting of the Gas Committee without a decision being arrived at, but it is most probable that at the next meeting the Committee will take definite steps to effect increases in the price of gas. Three months' notice must be given in the case of industrial loads.

Notice of an Increase in the Price of Gas is given by the Hastings and St. Leonards Gas Company "in consequence of the continued high price of coal and other increased expenses, and in the absence of any additional revenue from residuals." The charges to ordinary and prepayment consumers will be increased by 0·4d. per therm (1·84d. per 1,000 cu.ft.). The increase has effect from the Christmas readings of the meters or from the January prepayment collections. The published price of the Company is now 10·6d. per therm (4s. 0·76d. per 1,000 cu.ft.).

Excellent Publicity for Industrial Gas was obtained by the Sheffield and District Gas Company in an industrial supplement to the *Sheffield Telegraph* for Dec. 30. The front cover has a striking advertisement drawing attention to the fact that gas puts quality into Sheffield steel. In the course of the supplement there is an article by a special correspondent headed "Forty Million Cubic Feet of Gas Daily." This reviews the history of the Sheffield Company from a humble beginning in 1818 to the tremendous influence it now is in one of our greatest industrial centres.

An Unprecedented Rush of Coke Orders was experienced by the Leamington Priors Gas Company during the few days preceding Christmas, and a very determined effort was required to make certain that every customer should be assured of a supply. For, while the supply was adequate to meet all demands, the snow on the roads made transport very difficult. However, by strongly reinforcing the Company's fleet of delivery motors with hired vehicles all demands were met and every one of the Company's customers whose order had been received was served before the holiday.

Amalgamation and Grouping

Coatbridge and Airdrie.

A plebiscite of Airdrie ratepayers regarding the proposed sale of the Municipal Gas Undertaking to the Coatbridge Gas Company is to be held shortly. It will cost the town £200. Ratepayers are being asked if they favour selling the Works to the Coatbridge Company or, alternatively, to any other firm or company.

United Kingdom, Louth, and Royston and Brodsworth.

Close Brothers, Ltd., Secretaries, announce that the United Kingdom Gas Corporation, Ltd., has recently obtained control of the Louth Gaslight Company by acquiring a majority of the original share capital of that Company.

We learn that the United Kingdom Corporation has also taken over the Royston and Brodsworth Gas Company.

Newcastle Company's New Showrooms at South Shields

Our photographs show views of the Newcastle-upon-Tyne and Gateshead Gas Company's new showrooms at South Shields, reference to the official opening of which by Lady Readhead was made in the " JOURNAL " for Dec. 21.

THE interior is decorated in shaded cream and green, with green mottled rubber flooring and black surround. The window is effectively illuminated by a series of burners with reflectors in a ventilated trough. A counter is provided for the payment of accounts, and a representative range of modern gas appliances is displayed in suitable settings. The exterior is in Travertine marble with the wording above the window in double recessed box letters in black and scarlet. The whole frontage is slightly recessed, with " Gas Showrooms " outlined in terrazzo on the pavement.

Evaluating Performance of Gas Plant

New B.S. Retorts Test Code

The increasing attention that is being given at the present time to the evaluation of the performance of gas producing plant lends special interest to the issue of a British Standard Test Code for Horizontal Retorts, Inclined Retorts, Intermittent Vertical Retorts, and Intermittent Vertical Chambers.

Test codes for the carbonization process may differ widely in their scope owing to inherent differences in the purposes for which they are required. It is deemed essential to have a code which contains all the necessary data for the experimental determination of the yields and qualities of the main products together with full explanations of how these should be measured, but excluding reference to data which are not necessary to a general valuation of the behaviour of a given plant.

The British Standard Test Code would be too comprehensive for the purpose of checking guarantees as between the contracting parties in the construction of a new plant. When a gas undertaking purchases a plant under guarantee there are four main points on which the undertaking usually requires to be satisfied:

(*a*) That the yield of gas from the plant will be a given number of therms per day at a specified calorific value under normal working conditions.
(*b*) That the average calorific value of the gas, measured under standard conditions, shall be not less than a given figure.
(*c*) That the make of gas per ton of coal (containing a prescribed content of ash and moisture) under the conditions (*a*) and (*b*) shall be not less than a given figure.
(*d*) That the fuel charged to the producers per ton of coal shall not exceed a given figure.

The fulfilment of these four obligations is usually taken as implying that a carbonizing plant has satisfactorily passed its guarantee test. The conditions under which these figures may be accurately obtained are defined in an Appendix to the Code.

The new Code is the first to be issued by the committees which have been set up by the Gas and Solid Fuel Industry Committees of the British Standards Institution to prepare standard methods of carrying out performance and efficiency tests for the following types of fuel-using equipment: Gasification and carbonization plant; furnaces; ovens; kilns; and boilers.

Copies of the new B.S. Code (B.S. No. 819) may be obtained from the British Standards Institution, 28, Victoria Street, London, S.W. 1, price 3s. 6d. (post free 3s. 8d.).

British Standard Pipe Threads

Revised Specification

Nearly thirty years have elapsed since the publication of the current edition of the British Standard No. 21 relating to British Standard Pipe Threads, during which period there have been considerable developments in the technique of screw thread production and gauging. The British Standards Institution has according been engaged in a revision of this Standard, which is now available.

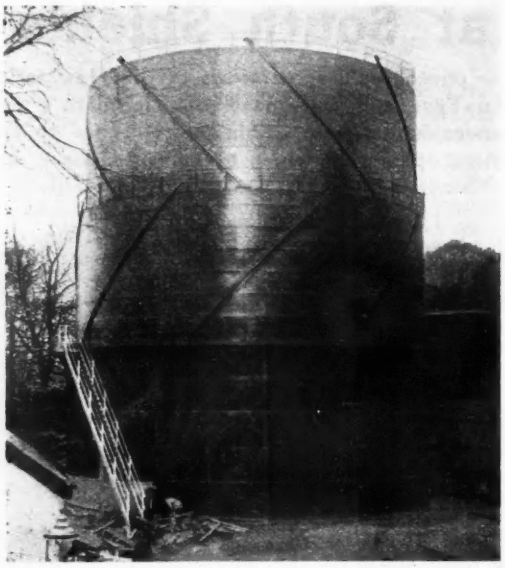
In a complete revision which it is ultimately intended to issue, recommendations will be included in respect of a system of gauging. In the meantime, however, the need of industry for definite information on certain essential points has become urgent, and it has consequently been thought advisable to issue without delay the conclusions already arrived at as regards the fundamental definitions and basic sizes of the threads and the tolerances to be allowed.

In revising the 1909 Standard the Institution has had it in mind to clarify and, where necessary, to amend the earlier editions without departing from their main features in any way which would be likely to cause confusion or difficulty due to lack of interchangability of existing parts with those made to the revised specification.

For this reason no changes are recommended in the pitches or gauge diameters of the threads, although it has been recognized that in certain cases, notably the $\frac{1}{2}$ in., 1 in., and $1\frac{1}{4}$ in. sizes, there are reasons why a change might otherwise have been desirable. In a few cases, however, the gauge lengths have been slightly altered in order to obtain more satisfactory lengths of engagement. It has been recognized that both taper-to-taper joints and parallel-to-taper joints are in common use, and provision has accordingly been made for both parallel and taper threads. The present revised edition of this Standard is limited to definitions of the form of thread and of the terms used and to the basic sizes and tolerances, these latter tolerances being given alternatively in turns of thread and of actual linear dimensions. The supplementary publication dealing with the subject of gauging is now being prepared, and it is hoped that this will be available for issue in the near future.

Copies of this revised Standard, No. 21-1938, price 2s., or 2s. 2d. post free, may be obtained upon application to the British Standards Institution, Publication Department, 28, Victoria Street, London, S.W. 1.

Windermere's New Gasholder Officially Inaugurated



Windermere's new gasholder was officially inaugurated on Dec. 15 last by Councillor J. B. Dixon, Chairman of the Gas and Water Committee of the Urban District Council. The ceremony was attended by a large number of representatives from neighbouring authorities, including the Mayor of Kendal (Councillor W. N. Shepherd), Major G. H. Pattinson (Chairman of Westmorland County Council), and the Chairmen and officials of many gas and water undertakings.

At a luncheon in the Royal Hotel which followed the ceremony, tributes were paid to Windermere's modern and efficient Gas Undertaking. Councillor Dixon presided.

Proposing the toast of "The Urban District Council of Windermere," Mr. J. Carr (Engineer, General Manager, and Clerk of the Stretford and District Gas Board) congratulated the Council and its Engineer on the efficient undertaking and carefully planned works which were tucked away in pleasant surroundings. He realized that the Council had spent a considerable amount of money on their most recent improvement, but they had spent it wisely. Without efficient works, properly managed and engineered, they could not render that service to the public which they, as an undertaking, claimed to do. Of the many problems which faced gas undertakings the coal problem was particularly serious, and he considered that the prices of coal were most unfair. In Windermere their coal was 31s. a ton and to transport it to the works cost another 2s. 4d. per ton. A further increase of 1s. or even 6d. per ton would make it difficult for their Undertaking to compete with other forms of fuel. Mr. Carr also spoke of successful experiments in connexion with gas-driven engines.

Major Pattinson, replying, said visitors to Windermere, which was entirely a residential place, expected the best services that a local authority could give them, and the completion of the new gasholder was a further great step in that direction.

The Chairman, proposing the toast of "The Contractors," complimented Messrs. Robert Dempster & Sons on their satisfactory work by which, he said, they had upheld a high reputation for that class of engineering. He recollected that it was only in February that the Council decided to advertise for tenders, and at the end of April the Ministry gave the Council sanction to borrow the amount required without a public enquiry. Mr. Dixon also paid a tribute to the co-operation he had received from fellow members of the Council and the officials.

Mr. W. H. Handley (Managing Director, Messrs. Robert Dempster), responding, explained that the new holder and tank weighed 122 tons, and the tank was 58 ft. in diameter. The capacity was 100,000 cu.ft. and the tank itself contained water weighing 1,600 tons. He handed Councillor Dixon a suitable memento of the occasion.

The Mayor of Kendal, replying to the toast of "Our Visitors," proposed by Councillor R. W. Worsdell, congratulated Windermere on the progress which had been made in connexion with its Gas Undertaking, and said he believed that, despite competition, there was a great future for the Gas Industry.

After Mr. M. T. Thompson (Managing Director, Messrs. Drakes, Ltd.) had also replied to that toast, the Chairman spoke in appreciative terms of the work done by the Gas Engineer and Manager, Mr. J. N. Leckie.

Mr. Leckie briefly replied and expressed thanks to members of the Council and officials for their help and co-operation.

Thanks to the Chairman were proposed by Mr. J. H. Ranft (Lytham St. Annes), and Major Pattinson, seconding, said he strongly opposed the purchase of the works at the time when they were taken over by the Council on account of their derelict state, but he was pleased to see that they were now perfect and could produce gas as cheaply as any other small undertaking in the country.

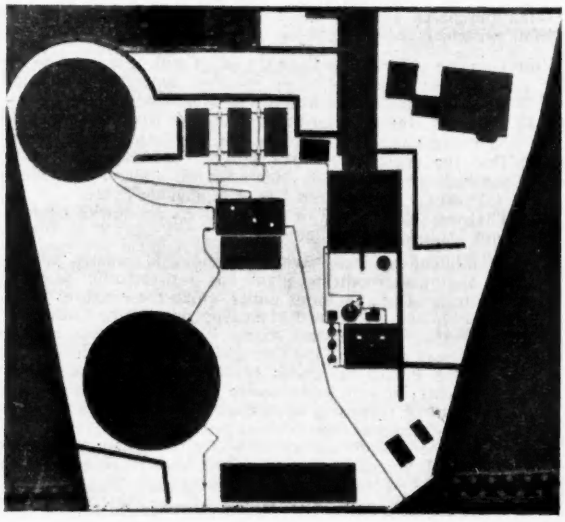
A.R.P. Model of the Gas-Works

The Lay-out at a Glance

At the official inauguration of Windermere's new gasholder, the guests inspected the holder and the works.

Considerable interest was aroused by the A.R.P. model of the works. This, illustrated here, is a complete scale model of the works showing all buildings, plant, mains, and valves. The various units are shown in separate colours, all the valves being finished in their appropriate colours of red, black, and white as recommended by the Home Office. The model is executed in wood and has a suitable key. It is interesting to note that the mains and valves are constructed from Meccano parts. Mounted on plywood and measuring about 6 ft. square, it is conveniently housed in the exhauster house, thus being accessible to all employees.

Since this has now been in use for nine months, the Windermere Gas Department suggests that it is the first of its kind to be directly constructed under the A.R.P. scheme.



A.R.P. Model of Works

You Have Been Warned! - - -

The first part of this article, contributed by a well-known fuel technologist connected with the carbonization industries who was formerly on the staff of a colliery company, was published in last week's "JOURNAL." In it opinion was expressed of the attitude of the coal industry towards gas and coke, and the query was raised as to why there should be antagonism between coal and gas. "We shall find," he said, "if we get together that there need be no fundamental divergence of views. . . . If we come to an arrangement now, the path of the Gas Industry may be greatly eased in the future, and solid advantages to the coal industry and to the population generally may accrue."

(*Concluded from p.* 50.)

Reference has already been made to the use of calcium chloride for dust prevention, this being applied to the coal, and to the coal receptacle. Reference has already been made to dustless packing of the coal. It is possible to-day—and not only in America—to burn coal without ever handling it, or even seeing it until the packages break open within the fire. In these ways, the dirt and some of the inconvenience of coal can be eliminated. It is proposed, however, to devote attention now primarily to the automatic stoker, because this appliance is already coming into general use and is affecting the sale of coke in this country and in the Northern European markets to which we export coke.

In this appliance, the coal is fed from a storage bin by a worm conveyor into the base of a pot-shaped furnace where it burns, the rate of coal flow and of combustion being governed by a thermostat. Because the coal is distilled at the bottom of the fire, the products of distillation are burned and combustion is smokeless; there is probably a good deal of finely divided fly-ash since the ash of necessity passes upwards to the top of the fire, but the whole arrangement is entirely automatic, clean (except for filling the bin), and smokeless. Moreover, it can burn small coal in place of the more expensive grades. It can burn smalls, for example, for heating a building in place of the more expensive coke required in the gravity feed boiler. Here is an extract from an address by Professor R. S. Hawley at the University of Michigan: "From the results of tests it appears that sizes from $\frac{1}{8}$ in. down will be more successful in household stokers than will the larger sizes. The best results we have had to date were obtained from coals of $\frac{5}{8}$ in. to $\frac{1}{4}$ in. size. We have had no difficulty in burning coals with as much as 50% slack. We have observed, however, that when burning slack coal there is a greater tendency for particles of ash to carry up with the gas flow and lodge around the heating surfaces of the boiler or furnace." A prominent stoker engineer has said that in his experience, on the large stokers of between 100 lb. and 500 lb. capacity, coal of $\frac{1}{4}$ in. to $1\frac{1}{4}$ in. will satisfy most makes. It is possible to buy these automatic stokers *in this country* for a *maximum* coal feed as low as 20 lb. of coal per hour. It thus appears that this system can be applied to those households, shops, or business premises that burn even less than 3 tons of coal a month.

Appeal of Automatic Stokers

Let us now see how these appliances are being handled in the U.S.A., always bearing in mind that the coal interests here are watching these developments closely. We must have no delusions about the appeal of these small automatic stokers. The stoker industry has been referred to as "America's fastest-growing industry." It is estimated that during 1938 not less than 1,000 million advertising messages were delivered to the American public by stoker manufacturers, stoker associations, and others interested in promoting the use of coal as an automatic fuel. The appliance industry recognizes automatic coal burners "as a possibility for one of their next big markets, such as the refrigerator market." The stoker is being described to the public as "The finest automatic heat that money can buy at the lowest cost of any heat." We are also told that "the sale, installation, and service of the small size stokers has been simplified to-day to a point where instead of being a complicated engineering line as they appeared to be formerly, they are rapidly getting into the classification of other domestic appliances." The tendency is now for the coal merchants to act as stoker salesmen, so that they are selling coal-burning appliances as well as coal.

"What is our market?" asks an American stoker manufacturer, "how many homes, apartments, garages, hotels, schools, and laundries, and what are their requirements for heating—hot water, cooking, steam and cooling? With the gas company pushing the sale of hot water heaters, do not overlook the magnitude of this market. At the elbow of every architect on a new house we find those famous twins—oil and gas—ready to show, and with some very convincing arguments, why the new home should be equipped to use their product. Any good stoker producer can help you to tear down every one of these reasons, to your mutual benefit."

Co-operative Advertising.

In Chicago, the coal merchants have formed an association to undertake co-operative advertising: "this advertising has been directed against the use of oil and gas as fuel. . . . It seems to have been effective." After discussion of the campaign there follows this significant remark: "What better way is there for the retail merchant to sell both services and results than by means of the automatic coal burner or stoker?" It is recorded that the American people "believe that automatic heat is the best heat—at least, it is less troublesome—and they want it. Naturally this desire made great inroads upon the business of both producer and retailer. The coal men wept and moaned and cursed their fate, but did little to improve their selling or to counteract this attack until the stoker manufacturer came along and made coal heat an automatic heat. . . . With the bin type of feed the only attention required is the removal and disposal of the ash; and there have been a few smart coal men who have undertaken to handle this matter for the householder so that no personal attention whatever is required. . . . National advertising by the stoker manufacturer is spreading the gospel of coal heat throughout the nation. . . . The stoker manufacturer looks upon the retail dealer as his most valued assistant and he co-operates fully with him to make him a modern, aggressive, up-to-date merchant and to increase the retailer's sales, *not only of stokers, but of coal.*" The italics are ours.

Enough has been said to show the potentialities of the automatic coal stoker. In this new appliance, the gas and coke industries will find, and are even now beginning to find, a powerful opponent, capable of extending them to the uttermost. The smoke and the dirt has been removed from coal utilization for all save the open fire and the smallest households. The vast field of business offices, public buildings, flats, shops, and larger houses has been invaded by a new competitor that will make out-of-date the over-complacent attitude of the gas and coke industries that coal is dirty, smoky, and should be prohibited for domestic uses by law. The Gas Industry has been warned!

Low-Volatile Coals.

This, however, is not all. Much yet remains to be done in the coal trade before the open grate is smokeless. Nevertheless, a start has been made already. Those who have not

read the recent Institute of Fuel Paper by Dr. Fishenden on: "Welsh Smokeless Coals for Open Fires," should do so without delay. They will find that the Welsh coal interests, having lost their shipping market, have now discovered that Welsh coal of about 12 to 15% volatile matter is one of the finest smokeless fuels for the open grate in the world. A point of the utmost significance is that many of the lower-volatile Welsh coals are not really suitable for the open fire, but *all are very suitable indeed in the specially-designed coke-burning grate.* This point need not be laboured. It will be immediately obvious to all that we have been installing these grates for the benefit of our competitors. The Gas Industry has at present the advantage over Welsh coals of price; this price may not be permanent. Experience has shown that low-temperature fuels can be sold at a higher price than gas coke. The Gas Industry can only meet this form of competition by producing more suitable cokes—and much remains to be done in that direction, both in the Gas Industry and still more in the coke oven industry.

The work described by Dr. Fishenden has been done under the auspices of the British Coal Utilisation Research Association. This body has in some not very clearly understood manner enabled the coal industry to bottle-up the inherent scorn of scientific methods that are part of the creed of certain sections of the industry, and to engage on scientific research into the problems of coal utilization. The experience of research in the Gas Industry will enable gas engineers to forecast that from this research is likely to come a greatly increased competitive power. Mr. J. G. Bennett, the Director of the Association, has stated at the recent Conference that "The British Coal Utilisation Research Association was formed this year, and it is a tribute to the growing appreciation of research as a potent factor in the future of coal that it has been launched with larger resources than the great majority of Industrial Research Associations, some of which are now of many years' standing."

Objectives of the C.U.C.

It might be expected that the technical men of the industry would understand that gas, coke, electricity, and coal were simply alternative means of coal utilization. We have to remember, however, that since part of the funds for the band would presumably come from the coal merchants, the tune must be such that they also can dance to it. Let us, therefore, look at the Fourth Coal Convention Papers.

The Director of the C.U.C., Mr. Anderson, paid lip-service to the value of other fuels. The objectives of the C.U.C., he said, are to retain present uses of coal where it is socially and economically desirable to do so and to encourage any new use which is in the national interest. That sounds good. The optimist might read into it a decision to retreat from the open coal fire, which is demonstrably not in the national interest, as all who have seen the recent smoke abatement display at Charing Cross tube station in London must appreciate. But Mr. Anderson says that one of the objectives of the C.U.C. is "to spread the news of the efficiency, the essential cleanliness, and, indeed, the beauty of modern appliances for room heating, cooking, and hot water supply." However, even that phrase might not be in contradiction to his first objective, for he couples it with another objective—to ensure a universal appreciation of the advantages of coal and its derivatives. Since gas is a derivative of coal, Mr. Anderson might still be on the right lines.

Later, however, he outlines a plan of campaign for co-operative sales effort on the part of the coal industry having as its basis the co-operation between the coal trade, the appliance interests, and the community to provide the general contact with the public which is so obviously and attractively present in gas and electricity. "We want coal showrooms," he says, "where all kinds of coal can be shown, with descriptions of their qualities and their appropriate uses. Associated with this display of coal there could be the apparatus for burning it." In other words, the sales technique of the Gas Industry is to be applied to selling coal—just as we have seen is done in America—and with obvious detriment to gas and electrical consumption. "Particulars of hire-purchase and deferred payment schemes would be readily available" in these coal showrooms. And Mr. Anderson adds: "Such coal showrooms, staffed by the C.U.C. and controlled by the local C.U.C. committees, on which there could be representatives of the coal owners and distributors of coal and appliances, would put us more on a par with our friends in gas and electricity and make the presentation of coal more uniformly effective." If gas, coke, and electricity are equivalent to the use of coal, since all are coal derivatives why should the C.U.C. desire thus to push raw coal before the general public? Clearly, the mask is torn away. The C.U.C., owing to the domination of its policy by one particular section, is out to replace gas by raw coal. The Gas Industry has been warned.

Finally, let us turn again to the Paper of the Director of the B.C.U.R.A. Mr. Bennett admits that the Gas Industry is "our very good friend, and indeed our good customer," but complains bitterly that this good friend is attacking raw coal. "Now what," he asks, "is the substance of this attack? It boils down to two things—that coal is inconvenient and dirty. It is admitted by the Gas Industry [the writer denies that it is so admitted]—and who can deny so obvious a fact—that coal is cheaper than gas, and that the British public has a warm feeling for the coal fire which even intensive propaganda is proving powerless to dislodge. When it comes to cooking, almost any chef prefers coal to gas, and in the heat storage cooker it has been shown that solid fuel can combine economic operation with convenience and cleanliness which put even the finest gas cooker in the shade. As we go to larger installations the superiority of solid fuel becomes still more marked—for example, well-established facts vouched for by the greatest authorities in the country, show that solid fuel is by far the cheapest and most satisfactory way of heating a large building. How is it that in spite of these overwhelming facts in its favour, coal is unmistakably losing ground with the small scale consumer? Some will say that it is due to the admirable propaganda which the gas and electrical industries are able to finance out of the wide margin between the cost of coal and that of gas or electricity. I think in this connexion that insufficient attention has been paid to the striking figures with regard to the profits of the coal, gas, and electrical industries quoted by the Director of the C.U.C. shortly after his appointment."

There we have the gloves off. What can this mean but that the funds of the B.C.U.R.A., supported by the Government, are to be devoted to the perpetuation of the use of raw coal, and to a diminution in the utilization of gas and electricity. The Gas Industry has again been warned.

Co-operation Desirable.

Mr. Bennett finally says: "I am sure you will feel that it is a pity that we have not been able to produce a means of lighting fires and destroying smoke which makes it unnecessary to use gas. I agree with this. . . . Although we may not wholly approve of the gas companies' publicity, we must recognize their spirit of enterprise, and if we can persuade them that the Englishman will never give up his coal fire, they will be glad to let the coal fire help them sell more gas. I am sure that we would all sooner see friendly co-operation than bitter competition between the many industries and trades which in the last resort depend upon our coal mines for their very existence."

We do not agree that the Englishman will never give up his coal fire, but we do agree that the spirit of co-operation is most desirable. Coke and gas are the products of coal. Will Mr. Bennett explain why it is that he regards it as desirable that raw coal (even smalls in the automatic stoker) should be burnt in the place of the manufactured fuels, coke and gas? That is the fundamental question.

There is no possible doubt in the mind of the writer that (1) the C.U.C. and the B.C.U.R.A. are intent upon pushing the sale of raw coal as opposed to the sale of gas and electricity. (2) If they pursue this policy the coal interests have in appliances and coals now available, in their research association, and in organizations of a type already well established in America, powerful methods which will enable them to turn the present gas-electricity competition into at least a three-cornered contest between equal opponents. (3) Some real attempt should be made to ascertain if there is not a method of enabling all interests to appreciate the part that the gas and coke oven industries take in preparing coal for the market so that this illogical competition can be avoided.

To delay is dangerous—the writing is on the wall—the Gas Industry has been warned.

A Serious Case of Corrosion and Its Cure

A Paper before the London and Southern District Junior Gas Association on Dec. 13.

by

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There are many theories of corrosion and, needless to say, all embody a large measure of truth. In the following Paper the writer does not propose to advocate any one theory in preference to all others. In fact, since corrosion is caused by such widely differing agencies it is obviously impossible that any one theory could have universal application.

In practice corrosion troubles may be divided into two broad classes:

(1) Where the attack is general and more or less evenly distributed.

(2) Where the attack is local, usually involving intense pitting.

Generally speaking, a cure for the first class involves the use of more suitable and usually more expensive materials or of some impervious coating, whereas the latter frequently responds to some adjustment of the conditions, and it is with this class that this Paper deals.

The amount of damage done by this class of corrosion is out of all proportion to the amount of metal removed, and the scientific staff of most works have frequent examples brought to their notice. Some of these are of comparatively simple origin, such as bimetallic corrosion—*i.e.*, the electrolytic effect caused by the use of two dissimilar metals in an electrolyte (or even in a damp situation) in such a way that a cell is formed involving the rapid disappearance of one of the metals.

As is well known,* the metals may be classified according to the voltage they produce in contact with a solution of their salts. The "noble" metals, such as gold, platinum, &c., which are easily reducible and not readily corrodible, stand at the head of such a classification, as they produce the highest voltages. A metal lower in this classification, placed in a solution of salt of a metal higher in the classification will go into solution and displace the more noble metal from its salt. For instance, iron will displace copper from a solution of copper sulphate, or copper will displace silver from a solution of silver nitrate. Where the two metals are in contact in an electrolyte the less noble will corrode more rapidly and by the electromotive force exerted will tend to protect the more noble metal.

Complications in Practice.

Many complications in the application of these facts occur in practice, since the condition of the surface of the metals has a large influence on the voltage produced. For instance, a stable oxide film tends to increase the voltage—that is, to render the metal more noble. Sometimes the polarity even reverses. This was found during an investigation into leakages between the threads of fusible plugs in boilers when brass, which is normally electropositive to iron in boiler water, was found to be electronegative at temperatures above 50° C. and hence to corrode appreciably. The substitution of iron bodies for brass has cured this trouble.

Another case of this nature was as follows: An aluminium governor bell was found to be perforated over a circular area, round the central support. This was due to the use of lead weights in direct contact with the bell. Since these were not submerged a cure was effected by the use of a rubber washer between the aluminium and the lead.

Apart, however, from corrosion troubles due to bimetallic action, there are many cases of more obscure origin which are much less readily diagnosed, and a very serious case which occurred at Beckton may be of more general interest. As usual, the removal of very small quantities of metal involved very considerable financial loss, but the magnitude of the trouble had one redeeming feature; it justified considerable expense in investigation, and finally the cause of the trouble was traced and the cure applied.

This example occurred at the active carbon benzole plant after about two months' running. As is well known, the bed of active carbon is heated during benzole distillation by steam coils embedded in the carbon granules. At the end of distillation the same coils are used to circulate cooling water to cool the carbon and to absorb the latent heat of the adsorbed benzole.

The coils work therefore as follows:

(1) 20–30 minutes—steam pressure of 50–90 lb./sq.in.
(2) 10–15 „ —steam shut off
(3) 60–80 „ —cooling water passing
(4) 5–10 „ —cooling water shut off
(5) Cooling water displaced by steam

The coils for one adsorber consisted of five separate banks, each consisting of 11 horizontal, rectangular spirals of 1 in. tubing connected to 2-in. vertical inlet and outlet headers. The set weighed approximately 11 tons. After two months' work the carbon in one adsorber was found to be saturated with cooling water. The carbon was emptied and the coils removed, and on examination they were found to be perforated, chiefly at the sides and bottom, by numerous pinholes. Examination showed that the trouble originated internally. The holes were welded and the coils replaced, but the coils from the other three adsorbers working exhibited symptoms of leakage almost immediately. This created a very serious position, as a set of five coils for one adsorber cost about £600.

Survey of Conditions.

A survey of the conditions was made, beginning with the water. This was certainly not attractive, being Thames river water from the tidal reaches at Beckton. The salt, normally about 100 grains per gallon, varies between 25 grains and 1,000 grains according to rainfall and condition of the tide. The *p*H is not bad, being usually 7·6-7·7, rising to 7·9 after circulation owing to evolution of carbon dioxide. Its mechanical condition, however, is good, as it is drawn from the river at a rate of 2-3 million gallons per day by a modern plant in which it is limed, settled, sand filtered, and chlorinated in sequence before sending out to the works. The satisfactory use of this large volume of water on an extreme variety of iron plant certainly led one to rule out the water itself as being the sole cause of the corrosion.

On the other hand, the fact that four sets of five coils each had perforated after the same period of work certainly suggested that the cause was not flaws in the tubing, since the perforations were spaced over almost the whole length of the tubing.

The cause of the trouble, therefore, must lie in the method of using the coils, and experiments carried out for another purpose finally indicated a clue to the trouble. Serious quantities of scale had been found in the base of the economizers though these were fed from a hot well where all the condensed steam from the adsorber coils was collected. Tests of this water indicated a hardness of 20 grains. Further investigation showed that when the river water was drained from the coils at the end of the cooling period a large percentage was left behind owing to the coils being horizontal, and that this residue was only displaced slowly by the condensed steam during the steaming period. The water was therefore totally unsuitable for the economizers which are

*Ref. U. R. Evans.

a form of vacuum evaporator and require a very good quality water feed.

Though undertaken from the point of view of water quality, these experiments indicated a very serious possibility of "differential" corrosion. After draining, the residual river water would form a layer in the bottom of the tube which would soon be covered by a layer of condensed steam soon after the steam was turned on. The two layers would not mix rapidly since the upper one would be hot and the lower one cool. The two layers of water would have a vital difference—namely, the upper layer would contain no sodium chloride, while the lower layer would contain 25 to 1,000 grains of sodium chloride per gallon.

The wall of the tube, in contact with these two dissimilar layers of water, would form an electrolytic cell, just as two dissimilar metals in one electrolyte will form a cell, and corrosion would be started wherever these two layers formed. Obviously there would be places where the steam velocity would cause rapid mixing, and thus destroy the layers, whereas at other places owing to slight tube irregularities, conditions would be favourable to corrosion.

The remedy—namely, to use water free from salt—was impossible immediately, as even town water contains 3-4 grains of salt per gallon. This small quantity, however, would minimize the trouble, and four fresh adsorbers were put to work under these new conditions.

A Further Source of Corrosion.

We were not, however, satisfied that the trouble was completely solved; work was continued, and a further source of corrosion was brought to light. The steam to the benzole plant was fed from modern Babcock tubular boilers running at 250 lb. pressure, using de-oxygenated feed water. Normally a considerable proportion of the oxygen dissolved in the feed water is absorbed by the economizers, boilers, and steam pipes, but some is usually left in the steam. In this case the steam was "oxygen-free," and consequently the upper layer of condensed steam in the adsorber coil would also be free from oxygen. But the circulation water, being cooled in the usual water cooling towers, was practically saturated with oxygen.

Differential corrosion caused by this agency is very intense and causes rapid pitting at the part covered by the de-oxygenated water.

In view of this it was decided to alter the cooling arrangements of the water for the coils. Instead of this being cooled directly in the ordinary tower, it was arranged that it should be cooled indirectly—*i.e.*, in cast-iron rack coolers, by the water from the tower. The cooling water would thus form a closed circuit passing via the pump to the rack coolers and back to the cooling coils. This was put in hand, but, of course, took some time to erect. In the meantime, the second set of coils had already exceeded the life of the first set, but began to fail after eight months' work. The removal of the salt concentration cell effect had therefore increased the life four times. Although encouraging, this improvement was not nearly sufficient.

So far all attention had been given to the action of the condensed steam and residual cooling water during the "steaming" period. To complete the investigation an attempt was made to assess the corrosion taking place in the cooling period, though it was felt that during this period the attack was more likely of the general equally distributed mass attack type rather than the intense local pitting which was our immediate trouble.

The dissolved oxygen was determined in the water at the inlet and outlet of the coils, at the start when the water was hot, at the mid period, and at the end of the cooling period. The results were as follows:

——	Start.	Mid Period.	End.
Temperature, ° C.	40–50	20	16
Inlet water	7·05	6·96	6·96
Outlet water	5·99	6·65	6·82
Oxygen absorbed	1·06	0·31	0·14

All figures are expressed in c.c. of oxygen per litre of water.

The average oxygen disappearing was 0·50 c.c./litre, and since 10,000 litres of water were passing, 5 litres of oxygen per hour were disappearing presumably in forming oxides of iron. This volume of oxygen would oxidize approximately a quarter of a pound of iron to Fe_2O_3 per day. Provided this was evenly spread over the inner surface the amount is negligible, though as pitting it could be very serious.

By this time the closed circuit system was ready for work, and it was put into action on Jan. 5, 1934. The system consisted of a small tank to be used at atmospheric pressure acting as a receiver for the water from the coils, from which it passed to a similar tank kept under vacuum by multi-stage steam jets. The rate of flow of water from the atmospheric tank to the vacuum tank was controlled by a float valve, which maintained the level of water in the vacuum tank constant. The centrifugal pump was of the type which had no glands under suction to avoid any possibility of indrawn air. The pump drew the water from the vacuum tank and forced it through the rack coolers back to the adsorber coils. The capacity of the system and speed of circulation were such that the water travelled round the circuit each quarter of an hour.

With the vacuum in the tank at 25 in. mercury, the following results were obtained three days after starting work:

Inlet to atmospheric tank	= outlet of adsorber coils	0·73	c.c. oxygen/litre
Outlet of " "	= inlet of vacuum tank	0·80	" " "
Outlet of vacuum tank	= inlet of rack cooler	0·58	" " "
Outlet of rack cooler	= inlet of adsorber coils	0·44	" " "

As can be seen, the results show a very greatly reduced oxygen content of the water, but they also show that the water:

Gained oxygen	0·03	c.c./litre	in the atmospheric tank
Lost "	0·22	" " "	vacuum tank
Lost "	0·14	" " "	rack cooler
Gained "	0·29	" " "	benzole plant

Tests made at the inlet and outlet of an adsorber coil were as follows:

——	Start.	End.
Temperature	30 ° C.	22 ° C.
Inlet	0·84 c.c./l.	1·43 c.c./l.
Outlet	0·34 " "	1·17 " "
Oxygen absorbed	0·50 " "	0·26 " "

Average oxygen absorbed = 0·39.

The conclusions drawn from these results and many more of the same type were as follows:

(1) Reduction of dissolved oxygen was considerable, being from 7 c.c./litre to (usually) below 1 c.c./litre.
(2) The water was coming in contact with air at the atmospheric tank; improvement in running conditions was desired here.
(3) The vacuum tank was extracting oxygen, but not sufficiently.
(4) The metal of the rack cooler was absorbing a considerable proportion of oxygen.
(5) Since separate tests still showed an absorption of oxygen in the coils, and yet the water picked up considerable oxygen in passage through the plant, there was still too much opportunity of contact with air in this part of the plant.
(6) Absorption of oxygen by the coils during cooling had only been reduced from 0·50 c.c./litre to 0·39 c.c.

These conditions did not appear satisfactory, and numerous steps were taken to remedy them. The chances of water coming in contact with the air in the atmospheric tank were reduced by closing the vent and allowing the pressure to fluctuate as the water level altered.

A spring-loaded valve was fitted at the common outlet of the coils, which ensured that no pressures below atmospheric would occur. This avoided any air being drawn in at any gland or leaking joint. Some general improvement was recorded, as is shown by the following, though these results were not maintained:

Inlet to atmospheric tank	= outlet of adsorber coils	0·09	c.c. oxygen/litre
Outlet of " "	= inlet of vacuum tank	0·38	" " "
Outlet of vacuum tank	= inlet of rack cooler	0·27	" " "
Outlet of rack cooler	= inlet of adsorber coil	0·24	" " "

Oxygen gained in atmospheric tank	0·29 c.c.
Oxygen lost in vacuum tank	0·11 c.c.
Oxygen lost in rack cooler	0·03 c.c.
Oxygen lost in plant	0·15 c.c.

In spite of attention to all details, however, zero oxygen

could not be attained, and an effort was made to attack the problem from a new angle.

Experimentally it was found that de-aerated water from the plant after pouring twice through air picked up 2·13 c.c. of oxygen per litre. If, however, the de-aerated water was shaken with nitrogen and then subjected to the same treatment it only absorbed 1·46 c.c. per litre. In the first case the water was almost completely de-gassed and in a state where air could be very rapidly dissolved, whereas in the second case the water would be nearly completely saturated with nitrogen, and the equilibrium with air would not be reached so rapidly. As is well known, if sufficient time was allowed the final equilibrium solution of oxygen would be the same in both cases, and the difference would only be in the speed of attainment of this position. The vacuum tank, therefore, was performing two functions—namely, the extraction of nitrogen, which was undesirable, and the extraction of oxygen, which was desirable. Another difficulty was the question of feed water to the system. The make-up water consisted of condensed steam from the coils during steaming. It had been found extremely difficult to maintain this oxygen free, though it was desirable to feed as much as possible to the circuit in order to maintain the exact "match" of water and steam and so avoid corrosion.

Different Method of Working.

In view of these facts, it was decided to make a trial of a different method of working. Instead of using vacuum, and thereby producing de-aerated water, it was decided to use a nitrogen atmosphere and nitrogen saturated water. This would render the water less susceptible to a short period of contamination with oxygen. Actually, the use of a nitrogen or coal gas atmosphere had been considered originally, but had been abandoned as it was thought that the expense of a small gasholder would be required. However, a method described below was devised, which appeared practicable.

The vacuum tank level valve was put out of action, and when the tank had filled completely the vacuum jets were shut off, and no vacuum was used. All the coil steam-traps were vented directly into the atmospheric tank, and the automatic valve was set to bleed the excess out of the system. The "atmosphere" above the water in the atmospheric tank was displaced by nitrogen from cylinders. The circuit was now being run with oxygen free but nitrogen saturated water. The improvement after a few days of the alterations was marked and can be seen in the following table:

Date.	Remarks.	Inlet Atmos. Tank. C.c./ Litre.	Outlet Atmos. Tank. C.c./ Litre.	Inlet Rack Cooler. C.c./ Litre.	Outlet Rack Cooler. C.c./ Litre.	Feed Water. C.c./ Litre.
1/6/34	Vacuum tank in work	2·18	2·03	0·61	0·28	2·53
4/6/34		0·37	0·82	0·45	0·39	4·39
6/6/34		0·48	0·76	0·41	0·28	3·77
13/6/34		0·11	0·26	0·22	0·15	0·39
23/6/34		0·26	0·37	0·30	0·20	0·65
26/6/34		0·11	0·34	0·19	0·11	2·46
27/6/34		0·22	0·37	0·37	0·28	0·17
4/7/34	Trial without vacuum	0·31	1·47	0·97	0·44	4·49
		0·33	0·48	0·45	0·33	1·21
		0·20	0·60	0·43	0·24	1·51
6/7/34	No vacuum restart after shut-down	0·54	0·89	0·74	0·54	0·71
7/7/34	No vacuum	0·17	0·33	0·39	0·22	0·95
9/7/34		0·71	0·99	1·00	0·91	1·80
10/7/34		0·50	0·70	0·73	0·62	0·66
11/7/34		0·04	0·06	0·07	0·02	0·84
12/7/34		0·00	0·02	0·02	0·00	0·06
13/7/34		0·00	0·02	0·00	0·00	0·39
14/7/34		0·00	0·00	0·00	0·00	0·91
16/7/34*		0·01	0·03	0·04	0·00	0·60
17/7/34		0·00	0·00	0·00	0·00	0·04
18/7/34		0·00	0·00	0·00	0·00	0·00

* Monday.

During the first week 100 cu.ft. of nitrogen were blown into the atmospheric tank, but for the rest of the period shown the system needed no further supplies. Some nitrogen would be supplied automatically by the permanent gases left after condensation of the coil steam, and these are found normally to make up any losses. If a pipe has to be broken out for valve replacement or any other cause and any air is allowed to leak in, it is found advantageous to add nitrogen to displace it and so avoid oxygenated water.

The system of operation is no more complicated than before, and is as follows: At the beginning of steaming the coils are full of water with the inlet and outlet water valves closed. Steam is turned on and the outlet valve to the atmospheric tank is opened. The coil water, therefore, is discharged by steam. As the coil empties of water the outlet (known as the quick drain) is closed, and a steam-trap allows condensed steam and any permanent gases to drain continuously into the atmospheric tank. When steaming is finished the inlet steam valve is closed and the outlet water valve is slightly opened as soon as pressure has fallen below that of the circulating water, to prevent pressures below atmospheric forming, since this condition renders it liable to entry of air through faulty glands, &c. When the cooling water is required on the coils the inlet and outlet valves are fully opened and the cycle repeated.

Since this system has been put in action (in July, 1934) the oxygen in the circulating water has been maintained at zero, except when repairs have necessitated opening it to atmosphere for valve replacements, &c. Even under these circumstances the oxygen has only risen to a small extent and has returned to zero within two or three days. Normally the system makes its own supply of nitrogen from the small residual amount of permanent gases left after condensation of the steam. If repairs necessitate air being allowed to enter the plant, it is displaced by nitrogen from cylinders, though this is of rare occurrence.

No further internal corrosion has been noted, and repeated internal examinations show that the inside of the coils where it can be examined are still in excellent condition. Many of the coils were drilled in selected places, so that a tiny electric bulb on a fairly stiff wire could be inserted and the inside surfaces examined. This is a very satisfactory condition, since many of the coils had had considerable service under the old conditions and were therefore seriously pitted when they started work under the new conditions.

Not the Only Cure.

The method adopted in curing this trouble is not, of course, the only possible one, since the aim here was to utilize an existing design of plant as far as possible. In a new active carbon benzole plant in course of erection for another Station of the Gas Light and Coke Company a different method of working has been evolved. In this case, instead of matching the steam condensate and the cooling water, water is used for both heating and cooling. In the former case the water is raised to a suitable pressure and temperature (above 100° C.) by steam, and in the latter it is cooled in a cast-iron rack cooler. The two water supplies are interconnected by a "balance" tank, and since any layers are avoided corrosion should be eliminated.

This case of corrosion has therefore been definitely cured, and since it was of such magnitude detailed tests are available to show all stages of its investigation. This type of corrosion is a very common one on gas-works and is worth analyzing, as, while there are not many active carbon plants, there are many places where similar troubles may occur. In the first place, it must be very strongly stated that the trouble was not cured by merely removing dissolved oxygen from the water. The corrosion was cured by removing the intense local driving force which consisted of an electrolytic cell formed by part of the iron being in contact with two layers of water of dissimilar condition. The upper layer contained no dissolved oxygen and no sodium chloride, while the lower contained dissolved oxygen and sodium chloride. By making the condensed steam and the residual water *identical* the corrosion was stopped. Had the condensed steam contained oxygen, reducing the dissolved oxygen in the residual water layer to zero would not have stopped the pitting completely. Then a difficult position would arise—namely, to match the oxygen content of the two water layers. Obviously the easiest value at which to match the two water layers is at zero oxygen, and this fortunately was our condition; but it is important to realize that it was the "matching" of the two layers, rather than the zero value, which resulted in the cure. De-oxygenated water, as a matter of fact, is a difficult liquid to handle, since it is liable to cause intense local corrosion whenever it is led into ordinary aerated water, unless there is rapid mixing.

Equally dangerous is leading aerated water into de-aerated water, such as boiler feed water into a boiler, since the water

in the boiler is de-aerated by boiling. Here it is usually sufficient to carry the water well into the boiler so that mixing is ensured before defined layers can come in contact with the shell or tubes.

Trouble Caused by Stagnant Water.

This form of trouble is accentuated where the layers of water are practically stagnant. For instance, on purifier sets it is customary to log the bridle mains which are not in use with water. In some of these the valve disc is vertical, and when the logging water is pumped away a layer is left in the groove in which the valve works. This soon becomes covered with a layer of zero oxygen water condensed from the gas, and local corrosion occurs. The cast-iron valve body and disc resist this form of corrosion well, but the half elliptical spring which holds the disc in contact with the face suffers badly at a point level with the surface of the water. In this case the water is stagnant.

Another case in which the water is in motion can be cited. Condensed steam from the surface condensers (low in oxygen) is pumped into the softened water main. Accelerated corrosion usually occurs at the junction where the two waters meet. This can be cured by leading the smaller of the two streams into the centre of the other stream, so that mixing is ensured before contact with the walls takes place.

A special case of this form of corrosion is the one where the actual conditions form the dissimilar layer. If for any reason a part of the water is trapped so that little diffusion can take place the iron will absorb the dissolved oxygen, and then a cell is formed between this and the main body of oxygenated water. This water may be "trapped" by being absorbed by a pile of rust between two surfaces, or in some crevice. In these circumstances, of course, many other complicated forces are acting and the problem is not quite so simple and straightforward as the previous cases cited. Those interested are referred to the many Papers on this subject by Dr. U. R. Evans and particularly to a recent joint statement by Dr. Benegough and Dr. Evans in *Chemistry and Industry*, Nov. 5, 1938.

In a gas-works, however, there are very many applications of the differential aeration theory of rusting, and I hope that the work reported here may be of assistance to others and may help them to cure some of their troubles.

Discussion.

Dr. S. PEXTON (Gas Light and Coke) said he was delighted to hear Mr. Dougill's account of the solution of the corrosion problem which clouded the initial stages of operating the active carbon benzole recovery plant at Beckton. They might recall that for some three or four years prior to the installation of the Beckton plant the Company had a small active carbon plant in operation at their Harrow Works. It was not until the Beckton plant was already built and ready to go to work that the first signs of corrosion appeared at Harrow—after some three years working. The conditions at Harrow were considerably less drastic from the corrosion point of view than at Beckton, the principal difference being the use of well water, subsequently used for boiler feed supply, as a cooling medium. This water was of very much lower salt content than the brackish Thames water, further concentrated by re-cycling over a cooling tower at Beckton. The system of external rack coolers with closed circulation of water and de-aeration by vacuum was adopted at Harrow. Meanwhile, the acute corrosion problem had arisen at Beckton, and a similar system was put forward, with a difference that at Beckton it was impracticable to place the vacuum storage tank at a height of 30 ft. so as to maintain the operating valve spindles attached to the adsorbers under positive pressure. Mr. Dougill had described to what extent the vacuum system fell short of being a complete solution of the problem and had made the ingenious suggestion for putting the water circulating system under pressure, using nitrogen to fill the free space necessary to allow for periodic displacement of water from the coils by steam during distillation. At Harrow they had continued with the vacuum system of de-aeration where it had not been a complete success because of the fact that the steam, supplied from three sources, was raised from boiler feed water containing air. To provide for such a case it had been decided to employ in the new plant at Bromley—where, like Harrow, but unlike Beckton, air-free steam did not exist—a combined system of indirect heating as well as indirect cooling developed by Mr. Hutchison. In this case the coils were at all times filled with water under pressure. During distillation the water was circulated through an indirect steam heater, and during absorption the water was circulated through an indirect air cooler. This system had not yet gone to work; but if it provided a practical solution of the corrosion problem it had an advantage in that the hot water from a filter completely distilled could be automatically transferred to the next filter to be distilled via a balancing tank, thus conserving a considerable amount of heat wasted in existing cooling systems.

Passing from the particular case under consideration to a more general corrosion problem—viz., condenser tubes—continued Dr. Pexton, the modern horizontal tube condenser presented many features in common with the present case—particularly if the cooling water was circulated over a cooling tower. This had the effect of increasing the salt concentration in the water and the difficulty of air release from the horizontal or slightly inclined tubes—especially on the side where the water flowed downwards. One solution of this condensate problem, which, however, involved extra initial cost, was the use of condensers entirely of cast iron. It was believed that one such water-cooled horizontal condenser had been in operation at Bournemouth since 1912. Experience with the cheaper mild steel construction was very variable, partly due to variation in methods of manufacture of the tubes and variations of quality of circulating water. A somewhat analogous system of indirect cooling, similar to that described by the Author, was a well-known type of washer-cooler very largely used on the Pacific Seaboard. It might be of interest that such a cooler designed by Mr. Silver was about to be installed for the cooling of gas from horizontal retorts at Bromley.

Another Solution.

Mr. DOUGILL emphasized that the particular case of corrosion in the Beckton plant was given as an example of differential oxygen corrosion, but the cure he had outlined was not put forward as the only cure. At the Bromley Works a different system was adopted, in which instance the coils were always filled with water—in one case with superheated water and in the other case with cold water—thus eliminating all possibility of differential oxidation.

Mr. A. B. DENSHAM (Gas Light and Coke) observed that some examples of the steel were sent to Watson House to be analyzed, and they found that it was very good steel. They had a case of this differential oxygen corrosion in the laboratory—in a bath into which air was bubbled at the bottom, and more on one side than the other. This definitely produced corrosion; so they arranged to bubble the air in equally all round in the hope of stopping the trouble. He asked if Mr. Dougill thought the trouble was to be expected only with iron, or was it likely to occur with other metals?

Mr. DOUGILL said that he had not gone into this matter very closely, but it devolved upon the question of nobility of metals. Although Evans placed metals in a certain order, that order could be reversed when the surface of the metal became oxygenated. For example, iron with oxygen bubbled over its surface was more noble than a metal higher up the scale without oxygen. That was why one did not always get bi-metallic corrosion when one might expect it. There was no doubt that differential oxygen corrosion occurred mainly in iron, but it would also occur in other metals.

Mr. BANKS said that in his case when they had commenced to de-aerate their circulating water the oxygen content of the condensed steam was of the order 7 c.c./litre, because they had no de-aerators on the boiler system; so there was still every possibility of this differential oxygen corrosion occurring. They were now hoping to get better matching by retaining a closed circuit but discontinuing the vacuum. Although they were getting much better matching, small differences still existed which were already proving almost as bad from the point of view of corrosion as the larger differences which existed before. There was, however, a definite improvement in the working of the valves and steam traps with a closed circuit. Mr. Banks mentioned another case of corrosion he had experienced. They had on the works a number of underground mains, in pits, supported on brick bearers, and they had recently come across definite pitting of the same type as one got in external coils. This might be due to accumulations of dust which had remained damp for long periods.

Mr. F. O. HAWES (Tottenham) remarked that many small undertakings, although possessing telescopic gasholders, never used them as such. They were inflated when first put into commission and remained inflated for years on end. He had himself experienced such a case, where a holder had been blown up when it was built and had remained blown up ever since—until the Undertaking was acquired by the Tottenham Company. When they examined it they found very serious corrosion in the lute, about 4 in. down. Until that evening he had put the trouble down to a sulphur cycle taking place in the stagnant water in the lute; there was a considerable amount of iron sulphide in the bottom of the lute, and it was thought that sulphur bacteria were producing H_2S and giving a dilute acid solution by oxidation from the air which was attacking the holder. The side of the holder facing *away* from the gas-works was less affected than the side facing the purifiers and retort house, whence one might expect the sulphur products to be coming. Now, however, Mr. Hawes felt inclined

to think that the stagnant water in the lute might also be absorbing oxygen from the air on the surface, while the water at the bottom was losing oxygen—thus setting up a differential such as Mr. Dougill had outlined in his Paper. Mr. Hawes suggested that all gasholders be dipped regularly to ensure the water being changed. He was also interested in the suggestion that corrosion in the coils was due to alternate expansion and contraction. Two Papers had been read some years ago before the Institution of Chemical Engineers in which it was shown how corrosion was accelerated by fatigue. He recalled the use during the war of "Paravane" apparatus to fend off mines from warships; tests at the National Physical Laboratory showed that fatigue, together with the action of the sea water, gave the towing cables a useful life of two hours. This was overcome by suitably protecting the cable. Cracker pipes in sulphate of ammonia saturators also had their lives considerably increased by being fixed firmly to counteract vibration.

Mr. DOUGILL said that he had never reached anything like so high a figure as 7 c.c./litre in the condensed steam. This emphasized the difficulty of matching two layers of water except at zero value. Very small differences would have an effect, and such figures were extremely useful in showing the difficulty of matching except at zero value. In a differential cell corrosion took place at the point of low oxygen; such corrosion was due to electrolytic force and not merely to the action of the oxygen. There was no doubt that one got some very strange differential effects in gasholder cups; they might not realize the amount of rainwater which ran down the sides into the cups, thus forming a layer of oxygenated water on the top of another layer comprised of the normal proportion of dissolved salts. As regards the effect of sulphur bacteria, it was possible that there were two or three driving forces causing corrosion; they could remove any one but they could not remove the whole cause unless they removed all the driving forces. As to the fatigue corrosion, he had not, perhaps, given sufficient data. The coils were on large trucks constructed of angle iron, and in some cases the coils rested on the angle. If there was a rivet in this angle rubbing occurred. They were now cutting off the rivet heads in order to eliminate these points of intense local rubbing. The failure of chemical lead was almost always due to fatigue.

Replying to another question, Mr. DOUGILL said that where one got a gradual increase or decrease in oxygen content trouble was less likely to arise. It occurred when there was a sudden change. In a holder cup the oxygen concentration varied by easy steps.

Mr. R. SUMMERSON (Luton) said that in a holder built just before the war they found severe corrosion on the inside on the side facing the sun. On the other side the interior was perfectly sound, and the white lead paint originally applied was as good as new.

Mr. H. J. RISBY (Severn Valley) said he had noticed repeatedly that corrosion occurred below the water line in gasholder cups—particularly in the skirts, where lamination of the skirting plate had occurred to such an extent that gas had escaped through the laminations from the inside of the dip on the pressure being released from the bead on the skirting plate. One always found that cups were attacked by corrosion even more than the curb plates in the bottom of the holder. He found the best cure was to coat the whole of the dip with a non-drying paint when the plates were new. It was no use applying the paint over corrosion because it would just go on underneath. The metal should be thoroughly clean before painting.

Mr. DOUGILL said he could not see any obvious reason why corrosion should occur on the sunny side of a holder rather than on the other, though there were certainly very powerful thermo flows set up inside a holder by the heat of the sun. There was a fog on one side of a holder which condensed on the other side; but he could not see how this could cause differential oxygen corrosion—though it might give some other kind of differential action. Mr. Risby had raised the point of water corrosion, which was another type of differential oxygen corrosion. The presence of ammonia might have something to do with the corrosion inside the holder. Replying to a further question by Mr. Risby, he said that a gasholder in a brick tank was not less liable to corrosion than a holder in an iron tank. Differential action occurred between very closely related places, and currents were usually dissipated in a very short space.

The meeting concluded with a cordial expression of thanks to Mr. Dougill for his Paper on the proposition of Mr. HAWES, seconded by Mr. H. MOYS (Commercial), which the Author duly acknowledged.

Athletic and Social

Ascot's Christmas Party

The annual Christmas Party for the Staff and employees of Ascot Gas Water Heaters, Ltd., was held at the Porchester Hall, Queensway, W. 2, on Dec. 23. About 1,500 were present and everyone voted the evening a huge success, there being no breaks in the continuous round of fun and merriment. Some two dozen spot prizes were awarded during the evening.

During an interval, Dr. Bernard Friedman, Managing Director, extended to everyone his cordial wishes for a happy Christmas and a prosperous New Year. He thanked the Staff for their loyal and faithful service through the trying times of the past year.

On behalf of the Neasden branch of the firm, Dr. Friedman was presented with a collection of books, while he received a table lighter from the Holborn branch. The presentations were made by Mrs. Lear (formerly Miss Lee), their first employee. Dr. Friedman was then accorded musical honours. Presentations were also made to Messrs. H. Naverling and K. Klein. The M.C.'s were Messrs. R. J. Gregg and Michael Croker. The hall was tastefully decorated for the occasion, and a large Christmas tree loaded with gifts was later sent to the children in Willesden Hospital.

East Surrey Co-Partnership Jubilee.

The East Surrey Gas Company's Co-partnership Scheme has this year attained its silver jubilee, and at the recent 25th annual meeting, another year of progress was reported, and tribute was again paid to the value of co-partnership in industry. There was a large attendance of co-partners and their friends, the latter having been invited to attend the meeting, as well as the concert which followed. Mr. W. Lees Stenning, J.P. (Chairman of the Board and of the Management Committee), presided, and he was supported by Messrs. W. H. Bennett (Vice-Chairman), R. Heath Mew, J. Urquhart, and A. E. Whitcher (Directors), J. R. W. Alexander (General Manager), Horace Long (Secretary to the Company and to the Committee), Ernest Scears (Chief Engineer), and Arthur Tennant (Sales Manager).

The Co-partnership Committee, in their annual report, stated that the number of co-partners on the register at June 30, 1938, was 274. The bonus and interest paid for the past year amounted to £2,669; the amount deposited on Savings Account was £646. For the purposes of co-partnership, the Directors allotted in September last the sum of £1,060 of Ordinary "B" Stock, at the rate of £125 per £100 Stock. Co-partners had invested in the capital of the Company during the year the sum of £1,800. Up to June 30 last the total amount of Ordinary "B" Stock acquired under the scheme was £18,330. Subsequent investments had brought the total up to £19,755, divided amongst 247 co-partners. The Directors had re-elected Messrs. Andrew Bayham, Arthur J. Claydon, and Leonard Heaysman to represent them on the Committee.

The Chairman moved that the annual report and statement of accounts be approved and adopted. Investments which started with about £20 in 1915 had grown to £18,330 at the end of the last financial year, and since then had been increased to £19,700, so he thought they might claim that through all these years they had shown steady progress. He asked them to remember they had duties over a very large area. They supplied a district of some 125 sq. miles, and something like 20,000 customers.

Mr. C. G. Burton seconded the motion, which was carried.

The Chairman announced that the co-partners' representatives on the Committee, Messrs. Alfred Gear and Thomas P. Knight, had been re-elected, and that, as the result of a ballot, Mr. Ronald C. Higley had been re-elected as the representative of Dorking and Capel. The Chairman then presented a certificate to Mr. Arthur George Butterfield for 25 years' faithful service. Mr. W. H. Bennett, amidst applause, presented a console radio set to Mr. Alfred Gear, which he asked him to accept in recognition of over 40 years' service with the Company. Mr. Gear, acknowledging the gift, said he appreciated very much what he had said, and hoped his years of service with the Company had been as good as they had been made out to be.

Following this, the Chairman presented his prize for the best batting average during the past season to S. Humphrey (average 19·3 runs per innings) and his prize for the best bowling average to R. Tugwell (average 7·4 runs per wicket).

Mr. F. S. Smith proposed a vote of thanks to the Chairman, Trustees, Committee, officers, and Auditors. Mr. L. J. Nicholls seconded the motion, which was carried by acclamation.

The Chairman suitably replied.

A delightful concert followed, and the excellent and diverse programme was greatly enjoyed by the large audience, who, on entering, received boxes of chocolates for the ladies and cigarettes for the men.

London and Counties Coke Salesmen's Circle

Annual General Meeting

The Annual General Meeting of the London and Counties Coke Salesmen's Circle was held at Gas Industry House on Wednesday, Dec. 14—the CHAIRMAN (Mr. J. Grayston, of Romford) presiding at the outset.

The CHAIRMAN presented his Report on the work of the Circle during the past twelve months. In the first place he apologized to the members for the absence of Mr. W. L. Boon, who was in Scandinavia as the representative of this country on the International Coke Cartel which was investigating the conditions of trading in the Baltic countries. It had been arranged by the Committee for Mr. Boon to address this meeting on the National position of coke marketing and on recent developments in the work of the L.C.C.A. It was several years since they had had an Address from Mr. Boon, during which time there had been many changes; this pleasure had, however, been postponed in favour of more urgent business. Mr. Grayston expressed the hope that they might in the near future have the pleasure of a Paper from the General Manager of the Association.

Referring to current developments in the activities of their Circle, the Chairman recalled the Joint Meeting last April with the Distributors' Branch, the results of which might be even more widespread and beneficial than the originators of the idea ever visualized. So impressed with the usefulness and value of the work done by the Coke Salesmen's Circle were the Distributors that they had decided to form a Circle—modelled on the lines of their own Circle—and Mr. Haddock was to officiate as their Hon. Secretary. On behalf of the Committee and members of their own Circle he had offered to give the distributors any assistance and co-operation that lay in their power, and it might be that they would be invited to share a Joint Meeting with them in the near future. To his mind, this could lead only to better relationship, understanding, and interchange of knowledge which they all so earnestly desired to see.

Looking ahead, a further recent development in the L.C.C.A. which might affect the work of the Circle had been the expansion of the field of activities by the inclusion of the Western Counties of England. It would appear that the beneficial work of their Circle in London and the Home Counties must be expanded in such a way that the contacts, contributions, and criticisms were available to coke salesmen in the extended area. For his own part, he could not see that the problems with which they dealt in London could be identical with those of the provincial areas, and it would appear that the needs of coke salesmen in these districts could best be met by their own Group Meetings and activities, which might or might not be parallel with their own. He put forward the suggestion as his contribution to the advancement of the work and interest of coke salesmen in districts which were rather remote from their own centre of activities.

They had referred on several occasions to a Coke Salesmen's Manual, and for some time a sub-committee had been engaged on the task. He believed he was safe in making it known that influential circles had now interested themselves in the publication of this Handbook, which in due course would be accessible to all who were concerned with coke selling and distributing technique. To those members of the Committee who had facilitated and activated this work he would like to offer his own thanks, and, he was sure, also the thanks of all the members of the Circle.

In closing his year of office, Mr. Grayston expressed his personal thanks to all members and especially to the members and officials of the Committee for the loyal and enthusiastic support he had received during the two years he had been Chairman.

The CHAIRMAN thereafter made a presentation to Mr. F. A. Haddock as a token of appreciation of his valuable work as Hon. Secretary of the Circle since its inception.

Acknowledging the gift, Mr. HADDOCK spoke of the pleasure it gave him to do what he could for the Circle. He had been very happy working with the different officers, and he much appreciated their kindness in giving him this tangible token of their goodwill.

New Officers and Committee.

Officers and Committee for the year 1939 were then elected as follows:

President.—R. W. Foot (Gas Light and Coke Company).
Chairman.—Roy Summerson (Luton).
Vice-Chairman.—H. W. Lovell (Ipswich).
Hon. Secretary.—F. A. Haddock (L.C.C.A.).
Committee.—F. C. Ashley (Gas Light and Coke), F. W. Freeth (Southampton), W. Johnson (Wandsworth), H. W. Kerridge (Croydon), H. E. Lethbridge (Tottenham), J. H. Parkes (Brighton), and *ex-officio*, W. L. Boon (L.C.C.A.), B. H. Almond (Watford), and J. Grayston (Romford).

Mr. SUMMERSON then took the Chair, and in voicing his appreciation of the honour they had done him, he said he would put forward his best endeavours in the interests of the Circle.

THE CHAIRMAN'S ADDRESS.

Mr. SUMMERSON said he valued the opportunity of serving the members in the capacity of Chairman of the Circle because for many years—long before the open coke grate appeared on the market—he had conceived an intense dislike for the smoke pall which hung over their towns and cities. When he first heard of the introduction of the open coke grate he immediately realized that here was a means of ultimately abolishing smoke; and since that time he had never ceased to urge the importance of the sale of the open coke grate and the education of the public in its use. He could, indeed, claim to be the pioneer of coke grates in Luton; what he believed to be the first coke grate in Luton was installed on his recommendation in a friend's house about ten years ago, while the second grate was installed soon afterwards in his own house—and he had used coke grates ever since. He became a member of the Circle at its inception and was now very gratified to occupy its chair, since it gave him a more effective opportunity of assisting the members in the sale of coke and thereby minimizing the very grave smoke nuisance.

The necessity for smoke abatement was a matter which was becoming more and more impressed upon the minds of the general public. The potential market for smokeless fuels was enormous, and the ultimate abolition of smoke would no doubt be achieved by a variety of methods—by the use of gas, gas coke, coke oven coke, low-temperature coke, electricity, certain types of coal and oil smokelessly consumed, and possibly by a revolution in the design of the domestic coal grate whereby ordinary coal might be burnt smokelessly. The Gas Industry must expect to share this market for smokeless fuels with several other industries. But he held the view very strongly that the Gas Industry could and would obtain the major share of this market because it could unquestionably supply the cheapest and most efficient smokeless fuels in gas and coke—especially where these were used in combination to satisfy domestic fuel requirements.

Working for the Abolition of Smoke.

His view of the duties of the members of this Circle, therefore, was this—that they were engaged upon the doubly important task of working for the ultimate abolition of smoke, and of securing for the Gas Industry a major share in the supply of smokeless fuel in the form of coke. Every smoking household chimney indicated a potential consumer of coke of the order of two tons or more per annum. In many other directions, also, the coke salesman had great opportunities; whether it was in the application of coke boilers for hot water, central heating, soil warming, producers for the drying of grass, &c., orchard warming in town or in country, there was a vast market awaiting them. If any problem arose in the sale or use of coke, their Circle was the appointed place for discussing it and seeking a solution. If, therefore, any of the members had any questions or difficulties, or suggestions for Papers, he hoped they would not hesitate to get in touch with him.

As most of them knew, went on the Chairman, he was not primarily a coke salesman. His daily work was concerned with technical problems in the production of gas and coke. But he could say that any difficulties which arose in the use of coke in his Company's area were referred to him, and the task of solving them evolved upon his colleagues and himself. He was therefore in everyday contact with the work of coke marketing and consumption and knew something of the difficulties with which the coke salesman was faced. He was therefore able to visualize their problems from both sides—the works and the district.

He took over the Chair at a most interesting time. They had witnessed the introduction of the finest coke advertising campaign they had yet seen, and the Approved Coke-Burning Appliance Catalogue had just been completed. They were thus being assisted very greatly in their efforts to promote the sale of coke. They were, therefore, all the better equipped to find new extensions of the coke market and to make room for the surplus coke from the North in their area at properly regulated prices. He confidently anticipated continued expansion in the sale of coke.

A hearty vote of thanks was accorded to the retiring officers and members of Committee on the proposition of Mr. R. G. MINNION (Gas Light and Coke), which was acknowledged by Mr. GRAYSTON. The remainder of the meeting was devoted to the "Question Box."

Education in the Gas Industry - - - -

Sir Frederick West Addresses Scottish Juniors at a Joint Meeting in Glasgow

Mr. N. C. STURROCK (President of the Western District) introduced Sir Frederick J. West to a gathering of 75 members of the Scottish Junior Association in the Royal Technical College, Glasgow, on Dec. 10. Mr. Sturrock described Sir Frederick as the first trader member of The Institution of Gas Engineers to be elevated to the position of Vice-President, and expressed the thanks of the Scottish Juniors to him for coming North to address them.

His "talk," said Sir Frederick—he refused to call it an address—was really a continuation of his William Young Memorial Lecture to the North British Association in September last. He did not propose to cover the same ground and assumed that every member was already convinced of the absolute necessity of acquiring a sound technical education and practical training to maintain and uphold the Gas Industry in its proper sphere of usefulness. He emphasized that there were few instances where Engineers operated single-handed, and that plans and schemes could only be brought to a successful conclusion by the help and co-operation of others. In addition to technical and practical knowledge, the Gas Engineer must possess the capacity to lead and control others. Education and practical training did not cease with the acquisition of knowledge, for the human factor must be studied.

Reasons for Unrest in Industry.

Sir Frederick told how in 1917 he had given evidence before a Government Commission which was enquiring into the reasons of unrest in industry; the conclusion reached was that the unrest was due to the extravagant display of the wealthy classes. Sir Frederick thought that to-day all classes were guilty of this. He referred to the frequent unrest in industry and commerce due to many causes, but arising mainly from lack of consideration of the human factor and the disappearance of the personal touch between employer and employee, and between the head of an undertaking and the members of his staff. He urged the necessity of staff and works committees to create mutual confidence and team work. These committees, said Sir Frederick, should not be regarded as having been set up to deal with grievances, but rather to form closer contacts between employer, staff, and workpeople generally and to ensure good team work. A good way to create satisfaction was to show the employees the state of the order book, thus letting them know how long their employment was likely to last; fear of unemployment was often a skeleton in the cupboard to many employees. The staff would also listen if told of the difficulties of the employer or executives.

Sir Frederick then spoke of the choosing of men to be superiors or foremen, and said that the days when men should be chosen for driving ability and lurid language were past. Tactless supervision could provoke difficulties and trouble, and men must be selected for their tact, ability, discipline, and control.

Cultivation of Goodwill.

He urged the importance of the head of any undertaking giving as much consideration to the cultivation of the goodwill of his staff and workpeople as to the securing the goodwill of his customers or clients. There did not appear to be any golden rule or formula to secure special knowledge, and he emphasized the necessity of a determination to make a study of the problems and difficulties of the human factor and to apply commonsense, tact, and diplomacy in all human relationships. The employer and the employee must each put himself in the other fellow's position. Inquests on all failures should be held, since these failures might be due to lack of appreciation of "family spirit" in undertakings, which might arise from lack of confidence in the human element. An atmosphere should exist that would make the humblest employee feel that he had a part in the purpose and future of the undertaking. In large undertakings it might be necessary to form small sub-committees for different classes of workmen to find out ways and means of making their employment most advantageous to all.

Sir Frederick then gave some advice on the handling of committees and boards and stressed the point of using language that everyone would understand.

In conclusion, the speaker said that the future of the Gas Industry was dependent on the correct combination of technical education, leadership, and consideration of the human factor.

Discussion.

Mr. R. COWIE (Hawick), President of the Eastern District, thanked the Western District for permitting the Eastern members to be present on the occasion of this meeting. Mr. Cowie thought that quarrels and disputes caused more trouble than technical details. Sir Frederick was the leader of a big business concern which was notable for its treatment of its employees, and he had given advice that all could take to heart. He expressed his appreciation of Sir Frederick's talk and thanked him for it.

Mr. E. G. SMITH (Dumbarton), Vice-President of the Western District, said he had listened with pleasure to the talk, but since conditions varied in different places no one could speak generally on this subject. Town Councils must also be considered when dealing with these matters. Mr. Smith thought that the Gas Industry was remarkably free from industrial disputes.

Mr. C. D. BLACKHALL (Edinburgh), Vice-President of the Eastern District, told of Edinburgh's system of Welfare Committees and Social Clubs and how these were leading to good fellowship and co-operation.

Mr. A. J. DOLAN (Glasgow) said that great credit was due to Sir Frederick for tackling this subject. Was it not the case at committee meetings that some workers would be afraid to open their mouths lest their chiefs got to know? Mr. Dolan raised the point of placing in public libraries books relative to the Gas Industry, and said that he had made it his business to find out the percentage of gas literature compared with electricity literature and had found that gas had only 5% of electricity.

Skeletons in the Cupboard.

Mr. J. M. DOW (Kirkcaldy) said that he, though now a Senior, was still very much a Junior at heart. They had listened to a most interesting an inspiring talk. There were still a number of skeletons in the cupboard regarding wages, &c. He, himself, had been reprimanded by the Federation of Gas Employers for giving too many holidays to his staff; this he thought was not right. The Gas Industry was still far behind the electrical industry in organization. He thought that the Junior's job should be made worth while.

Mr. W. KIRK (Motherwell) thought they must have co-operation in everything, but that Scottish undertakings generally were too small for the committee system to operate.

Mr. W. C. CAMPBELL (Galashiels) said the Scottish Associations had been honoured with the presence of Sir Frederick and suggested that this talk should have been given to the Seniors. Would Sir Frederick endeavour to let those present that day have a copy of his William Young Memorial Lecture, as he thought that lecture would be to the benefit of all? [The William Young Memorial Lecture was published in full in the "JOURNAL" for Sept. 14, 1938.—ED., "G.J."]

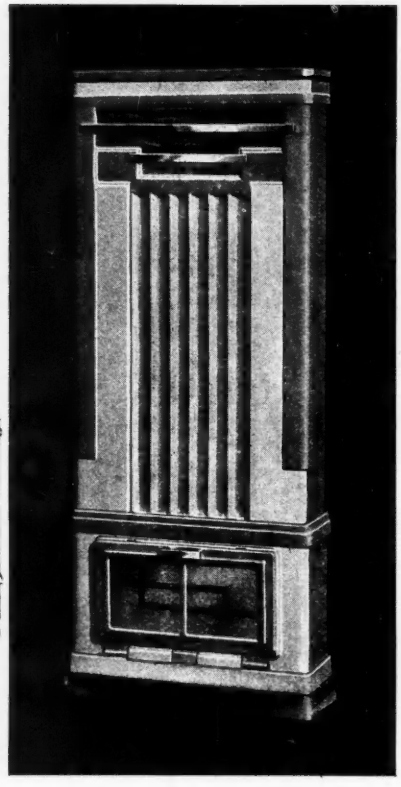
Mr. J. WEBSTER (Port Glasgow) suggested that the operatives in the Gas Industry knew that they were in a "protected" industry where their job was safe, and were sometimes inclined to play on this fact. He thought that money spent on Social Clubs was well spent.

Mr. W. N. BAIRD (Dunfermline) said that it had been a pleasure to listen to such fluent and virile remarks. There was a keen expectancy at this meeting, for they knew that they were to hear something that intimately concerned their future. They had all come to pick up some tips from one who had reached or perhaps had even passed his goal. He lodged a complaint against Seniors who disdained to acknowledge applications for positions. He thought that a standardized form of report regarding the working of all undertakings should be issued, as this might lead to a cheap and efficient form of research.

Sir FREDERICK, in his reply, said he thought that something would be done regarding salaries, and the subject of suitable text books for the Industry was very much in his mind.

On the proposition of Mr. STURROCK, Sir Frederick was accorded a hearty vote of thanks for his talk.

The Ideal Gas Heater for



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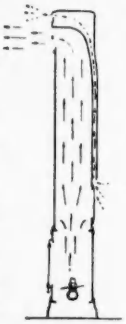

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London Juniors See New Tower Purifiers

Visit to Wandsworth Works

A large number of members of the London and Southern District Junior Gas Association gathered at the Chief Offices of the Wandsworth and District Gas Company on Jan. 7, where they were welcomed by Mr. C. M. Croft (Chief Engineer and General Manager) prior to inspecting the works.

The whole of the Company's coal requirements of 450,000 tons per annum is brought to Wandsworth by the Company's fleet of four colliers, the largest of which carries approximately 2,500 tons. The coal-handling plant consists of two hydraulically operated travelling cranes with 5-ton grabs, each capable of discharging 200 tons per hour into reinforced concrete hoppers on the jetty. These have a capacity of 1,200 tons, and from them the coal travels over a 48-in. rubber belt into a steel bunker of 150 tons capacity on the shore. It is thence fed on two conveyors either to the retort houses or storage. There is normal storage accommodation at the works for 60,000 tons of coal—equivalent to ten weeks' requirements. The coal is reclaimed from store by gravity bucket conveyors which travel through tunnels under the coal.

Gas Production Plant.

The gas production plant consists of intermittent vertical chambers, horizontal retorts, and carburetted water gas plant.

There are three batteries of chamber ovens. The first two comprise 66 ovens, each taking a charge of 3½ tons, the whole plant being designed to carbonize 460 tons *per diem* and produce 7 million cu.ft. of gas. Two waste-heat boilers are incorporated in this plant. The third battery is a recently completed installation of 36 ovens of the non-recuperative type, designed to deal with a throughput of 266 tons *per diem*, producing 4 million cu.ft. of gas. This plant also includes a waste-heat boiler which generates 13,700 lb. of steam at 190 lb. per sq.in. pressure.

The horizontal plant consists of 36 settings of ten retorts, situated in three separate retort houses having twelve settings in each. The carbonizing capacity of the whole horizontal installation is 600 tons per day, giving a gas production of 8 million cu.ft. A further waste-heat boiler is situated in No. 2 Retort House.

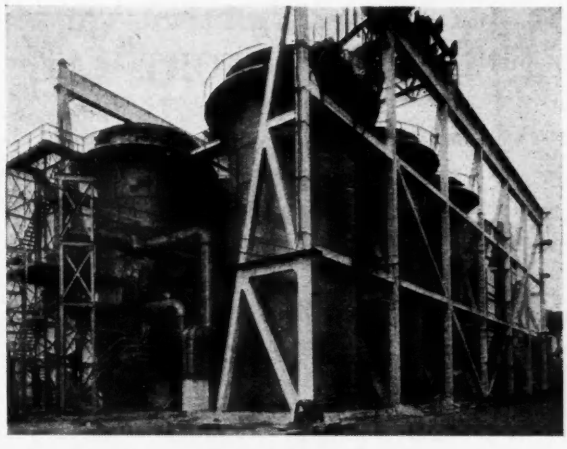
There are two complete units of carburetted water gas plant, each producing 2¼ million cu.ft. of gas per day and equipped with mechanical ash and clinker extraction.

Other points of interest at the Wandsworth Works are the coke handling and screening plant which is capable of dealing with 30 tons per hour and the centralized steam raising plant consisting of two chain-grate breeze-fired Babcock & Wilcox water tube boilers, each evaporating 25,000 lb. of water hourly, and one Thompson water tube boiler evaporating 43,000 lb. of water hourly. In addition to the four waste-heat boilers already mentioned, there are three Lancashire boilers evaporating some 35,000 lb. per hour. Steam is used for driving five sets of electrical generators with a total output of 2,070 kW each, which provide sufficient power (with adequate reserve) for all works purposes. There is also a benzole recovery plant, while the concentration of ammoniacal liquor is carried out in an automatically-operated plant. The clinker, ash, and coke withdrawn from the producers of the carbonizing plant are treated in a magnetic ash separating plant. Separation of the incombustible and combustible materials is effected by the attraction of the clinker, &c., in a magnetic drum.

The Tower Purifiers.

Chief interest centred, of course, round the recently erected tower purifiers—built by W. C. Holmes & Co., Ltd., to a design by the firm of Bamag-Meguin. The Wandsworth Works occupies practically a fully developed area of some 28 acres, with a river frontage of nearly one-third of a mile, and is capable of producing 22 million cu.ft. of gas per day. While this type of purifying plant has been adopted to some extent in Germany, it is unique in this country and will therefore be of particular interest to Engineers faced with the same difficulty as that experienced at Wandsworth—namely, space for additional purification plant.

The plant comprises a battery of six cylindrical towers 52 ft. 9 in. high and 22 ft. 4½ in. in diameter. Inside these towers are twelve polygonal trays with hollow central spaces, and each tray



The Battery of Tower Purifiers at Wandsworth.

carries 25 tons of oxide; thus each tower contains 300 tons of oxide, consisting of 70% bog ore and 30% Lux. The trays are divided into two layers of oxide, the gas entering between the layers and passing upwards and downwards through the material. Each tower is fitted with a reversing valve so that the gas can enter from the centre space and pass out between the trays into the space between them and the outside shell, or vice versa. Spare trays are provided which can be filled with fresh oxide in advance. A 50-ton crane, travelling on a gantry above the towers, removes the "lid" and substitutes the new trays for the old—the whole process being carried out very expeditiously. The total capacity for which the plant was designed is 10 million cu.ft. per day, but it is interesting to note that during the recent cold spell this throughput was considerably exceeded without any trouble at all.

The ground area of the plant, including the spare cylinder in which trays of fresh oxide are stored prior to transfer to a tower, is about 7,500 sq.ft., while the time taken to change the trays in one tower is approximately five hours.

The Company have not yet had sufficient experience of the plant to enable any working results to be given at this stage, but it may be observed that the capacity of the plant in relation to the ground space occupied may well offset the greater capital cost as compared with the usual box type purifiers. A portable purging machine is used when emptying the towers—purely as a precautionary measure.

Following the tour of the works, the visitors were entertained at tea in the Board Room, when the PRESIDENT (Mr. S. C. Waldock, of the Gas Light and Coke Company) voiced the thanks of the members for a most interesting afternoon. He also thanked the Company for their hospitality and the guides for giving up their Saturday afternoon to show them round.

Mr. H. MOYS (Commercial) seconded the vote of thanks and paid tribute to the technical interest and efficiency of the Wandsworth Works.

Mr. R. H. BUXTON (Deputy-Engineer) acknowledged the vote of thanks and said how pleased they were to welcome the Association at their works. Since the Association's last visit they had extended both as a Company and as regards those works. They were very pleased with the new tower purifiers, though it had to be admitted that they took their courage in both hands when they built them. The handling of the oxide was satisfactory, and the trays could be changed in a very short time. He hoped the Association would repeat their visit at no distant date.

"The Romance of Industry—Gas"

"The Romance of Industry—Gas" is the subject of an article in the current issue of the *Allen Engineering Review*. Extremely well written and full of lively historical detail, the article deals chiefly with the progress of the Gas Light and Coke Company, from whom Messrs. W. H. Allen, Sons, & Co., Ltd., of Bedford, publishers of the *Review*, have received further orders for a 90-h.p. steam engine for exhausting and a turbine operating against a back pressure of 80 lb. per sq.in. for driving a 500 kW alternator.

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Newcastle Coal Prices Enquiry

Evidence was completed when the Enquiry was resumed before the Durham District Committee of Investigation in Newcastle on Jan. 6 into the complaint brought by the Newcastle and Gateshead Gas Company that prices fixed by the Durham Coal Sales Control Committee in respect of 1939 contracts for the supply of class B Durham gas coal were excessive in comparison with those fixed for supplies to London gas undertakings and showed discrimination. This was the third full day of the Enquiry. Previous proceedings were reported in the "JOURNAL" for Nov. 30 and Dec. 21, 1938.

At Friday's sitting, the respondents, the Durham Executive Board under the Coal Mines Schemes, completed their evidence in which they submitted that the price fixed was fair and reasonable and within the public interest and, having regard to all circumstances and accepted practice regarding rail-borne and coastwise trade, there was no discrimination to the detriment of the local Company. It is agreed that the price fixed for the complainants was 18s. 6d. at the pithead and that the f.o.b. price charged to London undertakings, reduced for the purposes of the case to a pithead value, was equivalent to about 17s. 3d.

Most of the evidence and the cross-examination of Mr. T. Hornsby, Chairman of the Durham Coal Sales Control Committee, was accepted as of a confidential nature and heard *in camera*.

His cross-examination was completed on Friday and in answer to Mr. C. B. Fenwick, Counsel for the complainants, said that, in comparison with pre-war days, more capital and higher labour costs were involved to secure similar production and the preparation of coal for the market because of shorter hours. If a profit of 1s. a ton was regarded as desirable before the War, then he thought that a comparative figure to-day would be a profit of between 1s. 9d. to 2s. a ton.

Mr. Hornsby traced the advance in prices for gas coal, by mutual agreement among the parties concerned, since 1935, and then referred to a contract for supplementary supplies in 1938 and the price charged for this quantity was based on existing market conditions and was 20s. 6d. Having regard to this price, the 1939 contract price showed a reduction.

A Precautionary Measure.

Mr. T. P. Ridley, General Manager and Secretary of the Newcastle and Gateshead Gas Company, later recalled, explained that the supplementary supplies had been bought as a precautionary measure when they learnt that supplies of coke oven gas for which they had contracted would not be available until a later date. They had had to go on to the market at a time when there was a squeeze for supplies and had had to pay that price, which he had regarded as high.

Mr. Hornsby went on to explain recommendations sent out to districts by the Central Council of Coal Owners regarding effecting closer price co-ordination between districts and said it had been agreed that the only feasible method was to fix price on a delivery or f.o.b. basis according to whether the coal was land borne or sea borne. He considered that 18s. 6d. at the pithead was a reasonable and fair price for the Company to pay for the class of coal they were getting. He thought the Company had been treated in a very reasonable manner.

In answer to Mr. J. R. Ropner, a consumers' representative on the Investigation Committee, Mr. Hornsby said he agreed that gas-making was an efficient way to extract the heat content from coal and it was the wish of the Sales Committee that the heat content of coal was used efficiently.

Mr. Ropner observed that, if for nothing else, the enquiry had interested him greatly from the national point of view, and suggestions should come from the Committee which they hoped would encourage coal to be used efficiently.

Mr. Hornsby said that the Gas Company were competitors of raw fuel and were not doing things to the advantage of the Durham coal trade. They were using gas to oust raw fuel and the means whereby they did this was by the use of very cheap coke oven gas. If they carbonized raw coal, they could not effectively compete with raw fuel.

Mr. Ropner: Do you discourage collieries from producing coke oven gas?

Mr. Hornsby: I do not see that it is to the advantage of the coalowner, as such, to encourage the sale of surplus coke oven gas to gas companies in order to enable them to compete with raw fuel. If Mr. Ridley were paying 2s. per 1,000 cu.ft. for his coke oven gas, which I say is an economic price, then perhaps my objection would go, but I say he is getting it at such a ridiculously low price that it enables him to compete, and compete effectively, with raw coal.

In answer to other questions, Mr. Hornsby said that if Durham proceeds were to yield the 70% minimum on the county basis miners' wage rates which, combined, provided the minimum wage, which was the object of the Committee, then they had to try to get adequate prices. Once they got prices at that level, then they would do their best to hold them so as to maintain such results.

Dr. J. Charlesworth, Counsel for the respondents, addressing the Investigation Committee, said that it was not their duty to consider the comparative utilitarian aspects of gas and coal but whether the price of 18s. 6d. was a fair and reasonable one. It was a reduction on the price for the 1938 supplementary supplies and having regard to the anticipation that production costs in the county in 1939 would be higher, he considered it a fair price and one at which the Company could have no grounds for complaint.

Mr. C. B. Fenwick, for complainants, said that what the Durham coal trade was asking, in short, was that its bread be buttered on both sides. It sought that where co-ordination on prices existed or where consumers had no option but to buy their coal, to make their own prices. And that where competition existed, then they wanted the privilege of framing their prices to meet that competition. If that was their attitude and they sought all the advantages of a monopoly, then it was only right that their transactions be investigated to see that, according to the Coal Mines Acts, those transactions did not operate against the public interest or unfairly upon consumers.

They had been told that of the 7,000,000 tons of gas coal which the county produced for the inland market annually, only 500,000 tons was sold to gas undertakings locally. Now if 17s. 3d. a ton was a fair price for 6,500,000 tons sent coastwise, then surely it must also be a fair price for the 500,000 tons.

Mr. Fenwick contended that the coal control was using its monopoly powers to extract from local customers a price that was unreasonable.

The Chairman of the Investigation Committee, Colonel H. G. Faber, intimated that the Committee would report its finding on Jan. 13.

Trade News

Economic Gas Boiler Company, Ltd.

Mr. Tom Brook has been appointed Representative for the Economic Gas Boiler Company, Ltd., for Lancashire, Cheshire, and Staffordshire, in succession to Mr. J. H. Morley. Mr. Brook will commence duties on Feb. 1.

Carbonizing Plant at Swindon.

Messrs. W. J. Jenkins, of Retford, have received a further order (the second this year) for extension to the intermittent vertical chamber oven plant at Swindon. The extension consists of a setting of six 3·75-ton capacity chambers and an additional waste-heat boiler.

Packings and Jointings.

No catalogue of packings and jointings can be complete, for there are frequent occasions when conditions demand materials of special design and construction, but the new catalogue issued by Messrs. James Walker & Co., Ltd., is the nearest approach to completeness, and its foreword emphasizes that the Company's research department is constantly employed on tests and experimental work and that suggestions and drawings will be supplied whenever desired. Of special interest to the Gas Industry are "Gaskoid" sheet jointing to resist and make perfect joints for oil, petrol, benzole, &c.; "Grafitol" for service in oil and spirits at high temperature; "Nitresto" for resisting the action of nitric acid at any strength, and "Sulfesto," an effective resistant to sulphuric acid.

Plumbers' Brasswork.

We have received from Messrs. Walworth, Ltd., 90-96, Union Street, Southwark, S.E. 1, a copy of their illustrated catalogue and stock list, No. 2, of plumbers' brasswork. A suitable article for every requirement is to be found in the list, and in many cases there are several patterns from which to choose. Everything listed is carried in stock and can be delivered promptly. The list is comprehensive but condensed and carefully arranged for easy reference.

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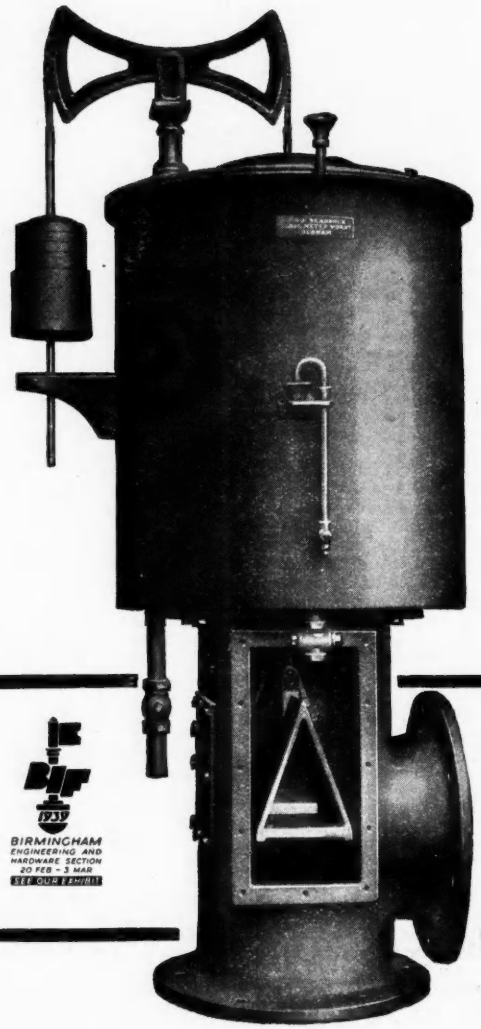
Especially desirable for use with vertical retorts.

Extremely Sensitive.

Detachable side plate enables valve to be easily removed and cleaned without disturbing any other parts.

Hydraulic Distance Control can be fitted if desired.

Particulars and prices upon application.



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Markets and Manufactures

Current Sales of Gas Products

The London Market

Jan. 9.

Prices of Tar Products generally remain unchanged at the following levels:

Pitch nominal at about 30s. per ton f.o.b.

Creosote, about 3½d. to 4d.

Refined tar, 3¼d.

Pure toluole, about 2s. 3d.

Pure benzole, about 1s. 9d.

95/160 solvent naphtha, 1s. 7d. to 1s. 8d.

90/160 pyridine, 10s.

All per gallon naked at makers' works.

The Provinces

Jan. 9.

Crude Gas-Works Tar, 14s. to 19s.

To avoid misunderstanding, it is necessary to state that the above price is not claimed to represent a market value. It is a price worked out from week to week upon a system which has been used for many years as a basis for the fixing of certain contracts for crude tar of varying qualities in different areas.

The average prices of gas-works products during the week were: Pitch—East Coast, 29s. to 30s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 29s. to 30s.* Toluole, naked, North, 1s. 7¼d. to 1s. 9d. Coal tar, crude naphtha, in bulk, North, 7¾d. to 8¼d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 5d. Heavy naphtha, North, 1s. 2½d. to 1s. 3d. Creosote, *ex* works, in bulk, North, liquid and salty, 4⅛d. to 4⅜d.; low gravity, 4¼d. to 4¾d. Carbolic acid, 60's, 1s. 7d. to 1s. 10d. Naphthalene, £13 10s. to £16. Salts, 70s. to 75s., bags included. Anthracene, "A" quality, 4¼d. to 4¾d. per minimum 40% purely nominal; "B" quality unsaleable. Heavy oil; Unfiltered anthracene oil, min. gr. 1,080, 4¾d. to 4⅞d.; filtered anthracene oil, min. gr. 1,080, 5¼d. to 5¾d.; heavy tar oil, gr. less than 1.080, 4¼d. to 4¾d.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Scotland

GLASGOW, *Jan.* 7.

No material alteration has yet taken place in prices, which remain easy.

Crude gas-works tar.—Actual value is now about 34s. to 35s. per ton *ex* works in bulk.

Pitch of vertical production is still available in substantial quantities at 21s. to 22s. per ton f.o.b. for export and round 20s. per ton *ex* works in bulk for the home market.

Refined tar.—Very little business is being placed, but home price is unchanged at 3¾d. to 4d. per gallon and export price at round 2¾d. to 3d. per gallon; both into buyers' packages at makers' works.

Creosote oil.—The market generally is inclined easy with values approximately as under: Specification oil, 3¾d. to 4d. per gallon; low gravity, 4¼d. to 4¾d. per gallon: neutral oil, 3¾d. to 4¼d. per gallon; all *ex* works in bulk.

Cresylic acid.—In the absence of any business of consequence prices are nominal as follows: Pale, 97/99%, 1s. 2d. to 1s. 3d. per gallon; dark, 97/99%, 1s. to 1s. 1d. per gallon; and pale, 99/100%, 1s. 4d. to 1s. 7d. per gallon; all according to quality *ex* works in buyers' packages.

Crude naphtha is steady at 5½d. to 6d. per gallon *ex* works in bulk, according to quality.

Solvent naphtha.—90/160 grade is 1s. 3½d. to 1s. 4d. per gallon, and 90/190 heavy naphtha is round 1s. 1d. to 1s. 1½d. per gallon.

Motor benzole is 1s. 3d. to 1s. 4d. per gallon.

Pyridine.—90/160 grade is 8s. to 9s. per gallon and 90/140 grade is 9s. to 10s. per gallon.

Benzole Prices

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.			
Crude benzole..	0	9½	to	0	10	per gall.	at	works
Motor „ ..	1	3	„	1	3½	„	„	„
90% „ ..	1	4	„	1	4½	„	„	„
Pure „ ..	1	8	„	1	8½	„	„	

Contracts Advertised To-Day

Coal.

Market Harborough Gas Department. [p. 130.]

Goods Lift.

Market Harborough Gas Department. [p. 129.]

Pipes and Specials.

Warrington Gas Department. [p. 130.]

Stores.

Port Talbot Gas Department. [p. 130.]
Stockport Gas Department. [p. 130.]

Bilston Capital Increase

The nominal capital of the Bilston Gas Company has been increased by the addition of £17,650, beyond the registered capital of £78,800. The additional capital is divided into 3,530 "B" shares of £5.

Diaries, Calendars, &c., Received

Seasonable gifts in the form of diaries, calendars, &c., have been received from the undermentioned friends, whose good wishes are cordially reciprocated:

Clay Cross Company, Ltd., nr. Chesterfield.

Dougall's Gas Meters, Ltd., Chiswick Mall, W. 4.

R. & A. Main, Ltd., London and Falkirk.

Parkinson Stove Company, Ltd., Stechford.

Peckett & Sons. Ltd., Bristol.

Westwood & Wrights, Ltd., Brierley Hill, Staffs.

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a bituminous paint producing a pleasant satin black finish with highly waterproof and anti-corrosive properties.

Protects steel-work which is continuously or periodically immersed in water. Does not become brittle on prolonged atmospheric exposure. METROTECT flows freely under the brush and can be applied quickly and without effort even in cold weather.

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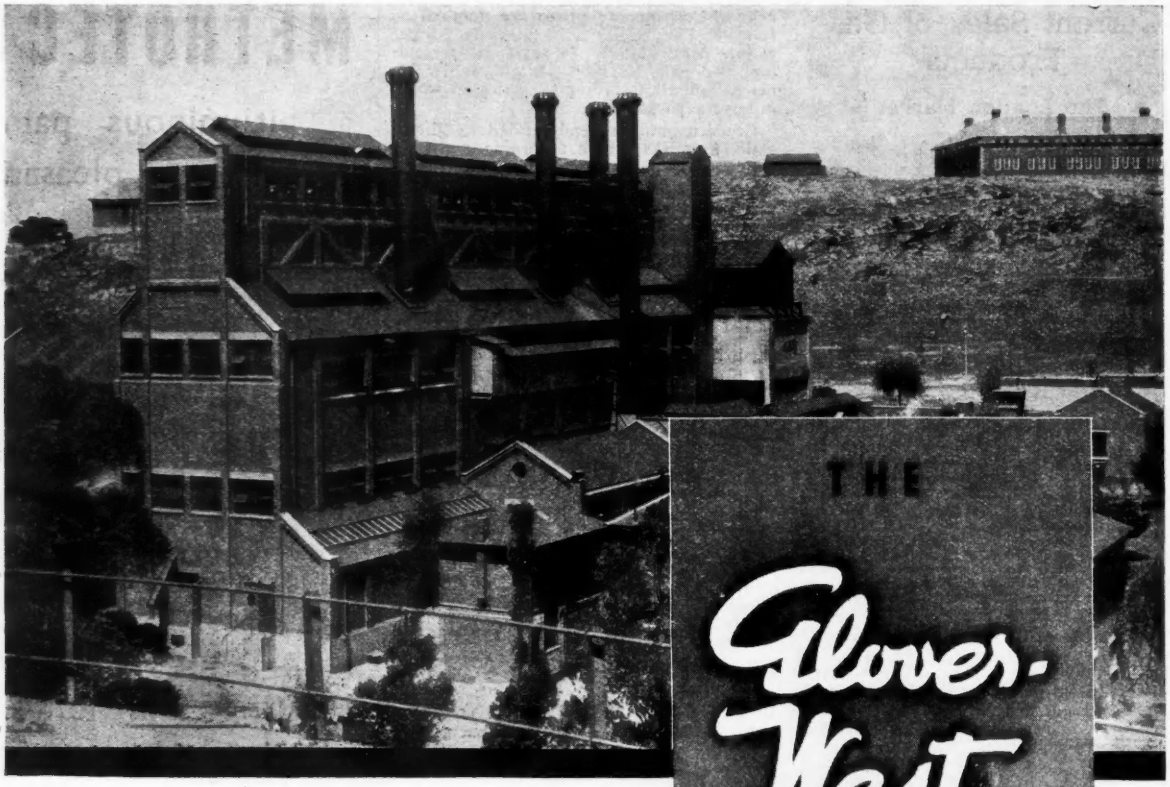
● CARBONIZATION IN VERTICAL RETORTS



The modern Glover-West vertical retort plant has behind it the accumulated experience of 64 years' constant research and development for the advancement of gas production methods the world over.

● *430 plants have been built or are on order for 230 Gas Undertakings in 24 countries.*

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The picture shows the three installations of Glover-West vertical retorts at Johannesburg City Council's Cottesloe gasworks. The carbonising unit of the complete modern gasworks ordered for Johannesburg from this company in 1926 has been trebled to meet the rapid growth of demand. The latest extension put to work in 1937 is nearest the camera.

●

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GAS STOCKS AND SHARES

Though the Stock Exchange opened optimistically on Tuesday last after the new Year's holiday, the volume of business showed few signs of expansion, and with the end of the Account in sight prices weakened. Gilt-edged stocks drifted downwards and closed from ½ to ¼ lower. Home rails on the whole were reactionary, but the announcement that the London and North-Eastern is paying the full year's dividend on each of its guaranteed stocks gave a fillip to these issues. Apart from a sharp rise in Cables and Imperial Tobacco shares on dividend prospects, prices in the Industrial section mostly went downwards, while the activity in iron and steel and aircraft shares was not maintained. Oil shares were fairly steady and a rise in the price of the commodity led to some demand for gold mining shares.

The volume of business in Gas stocks and shares compared with other sections was on the whole quite satisfactory, and with few exceptions prices remained the same as a week ago. It is satisfactory to note that Imperial Continental continued to recover and gained a further 8 points to 121½, while Montevideo stock hardened 2 to 74½. On the other hand, Plymouth and Stonehouse closed 5 points lower at 135, the stock changing hands recently at 137. It will be seen in the list below that a few minor movements also took place. All quotations on the Provincial Exchanges and in the Supplementary List remained unaltered.

The Watford and St. Albans Gas Company are offering for sale by tender £100,000 4% redeemable preference stock (1959) at a minimum price of £100%. Dividends on the issue will accrue from Feb. 1 next, and a dividend from that date to June 30 of £1 13s. 4d.%, less tax, will be payable in August and thereafter the half-yearly dividend will be payable in February and August. The activities of this undertaking are too well known in the Industry to need further comment here, but it is worth noting that the Company's area now covers 223 square miles, and that between 1935 and 1937 the sales of gas increased by over 12%. Tenders should reach the Company's offices not later than 12 o'clock on Jan. 12.

Official Quotations on the London Stock Exchange

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Jan. 6.	Rise or Fall on Week.
1,767,439	Sept. 5	8	8	Alliance & Dublin Ord. ...	130—140	...
374,000	Dec. 19	4	4	Do. 4 p.c. Deb. ...	93—98*	...
734,733	Nov. 7	5	5	Asscd. Gas & Water U'd'ts Ord.	17/—19/-	...
500,000	,,	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	19/—21/-	...
444,389	,,	4	4	Do. 4 p.c. Red. Cum. Pref.	19/—21/-	...
296,523	,,	4	4	Do. 4 p.c. Irred. Cum. Pref.	16/—18/-	...
500,000	Sept. 5	3½	3½	Do. 3¾ p.c. Red. Deb. ...	93—98	...
560,070	Aug. 22	7	7	Barnet Ord. 7 p.c.	158—162	...
300,000	Oct. 10	1/9⅔	1/4'	Bombay, Ltd.	24/—26/-	...
180,435	Aug. 22	9⅓	9⅓	Bournemouth sliding scale ...	195—205	...
640,407	,,	7	7	Do. 7 p.c. max. ...	157—162	...
495,960	,,	6	6	Do. 6 p.c. Pref. ...	130—135	...
50,000	Dec. 19	3	3	Do. 3 p.c. Deb. ...	75—80*	...
312,025	,,	4	4	Do. 4 p.c. Deb. ...	96—101*	—½
335,000	,,	5	5	Do. 5 p.c. Deb. ...	113—118*	...
357,900	Aug. 8	7½	7½	Brighton, &c., 6 p.c. Con. ...	142—147	...
659,955	,,	6⅔	6⅔	Do. 5 p.c. Con. ...	126—131	...
205,500	,,	6	6	Do. 6 p.c. 'B' Pref.	125—130	...
855,000	Sept. 19	8	7	British Ord.	133—138	...
100,000	Dec. 19	7	7	Do. 7 p.c. Pref.	138—143*	...
350,000	,,	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	112—117*	...
120,000	,,	4	4	Do. 4 p.c. Red. Deb. ...	95—100*	...
450,000	,,	5	5	Do. 5 p.c. Red. Deb. ...	100—105*	...
450,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	90—95*	...
100,000	22 May '33	6	4	Cape Town, Ltd.	1—2	...
100,000	6 Nov. '33	4½	4½	Do. 4½ p.c. Pref. ...	1—2	...
150,000	Dec. 19	4½	4½	Do. 4½ p.c. Deb. ...	60—70*	...
626,860	July 18	6	6	Cardiff Con. Ord.	118—123	...
237,860	Dec. 19	5	5	Do. 5 p.c. Red. Deb. ...	103—108*	...
98,936	Sept. 19	2/-	2/-	Colombo Ord.	1⅛—1⅞	...
24,510	,,	1/4½	1/4½	Do. 7 p.c. Pref. ...	22/6—24/6	...
739,453	Oct. 10	-/11·48	-/11·48	Colonial Gas Assn. Ltd. Ord.	16/6—18/6	...
296,144	,,	1/3·30	1/3·30	Do. 8 p.c. Pref. ...	23/6—25/6	...
1,775,005	Aug. 8	5	5	Commercial Ord.	77—82	...
140,000	,,	—	§13/4	Do. 4 p.c. Red. Pref. ...	95—100	...
620,000	Dec. 5	3	3	Do. 3 p.c. Deb. ...	71—76	...
286,344	Aug. 22	5	5	Do. 5 p.c. Deb. ...	113—118	...
200,000	,,	—	§30/2	Do. 3¾ p.c. Red. Deb. ...	97—102	...
807,560	Aug. 8	7	7	Croydon sliding scale ...	136—141	...
644,590	,,	5	5	Do. max. div.	100—105	...
620,385	Dec. 19	5	5	Do. 5 p.c. Deb. ...	112—117*	...
239,000	Aug. 8	5	5	East Hull Ord. 5 p.c. ...	95—100	...
186,155	Aug. 8	6	6	East Surrey Ord. 5 p.c. ...	116—121	...
176,211	Dec. 5	5	5	Do. 5 p.c. Deb ...	112—117	...
250,000	Nov. 7	8	4	Gas Consolidation Ord. 'B' ...	19/—21/-	...
250,000	,,	4	4	Do. 4 p.c. Red. Cum. Pref.	17/6—19/6	...
9,223,324	Aug. 8	5½	5½	Gas Light & Coke Ord. ...	22/3—23/3a	...
2,600,000	,,	3½	3½	Do. 3½ p.c. max. ...	77—80	—1
4,477,106	,,	4	4	Do. 4 p.c. Con. Pref. ...	98—101	...
2,993,000	July 4	—	3½	Do. 3½ p.c. Red. Pref. ...	98¼—101½	...
8,602,497	Nov. 21	3	3	Do. 3 p.c. Con. Deb. ...	76—79	—1
3,642,770	,,	5	5	Do. 5 p.c. Red. Deb. ...	109—113	...
3,500,000	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	107—111	...
700,000	Sept. 5	3½	3½	Do. 3½ p.c. Red. Deb. ...	93—98	...
270,466	Aug. 22	6	6	Harrogate New Cons. ...	117—122	...
157,500	Mar. 21	1/2½	‡1/-	Hong Kong and China Ord. ...	⅝—¾	...
213,200	Aug. 8	6	5⅝	Hornsey Con. 3½ p.c. ...	97—102	...
5,600,000	Oct. 24	12	8	Imperial Continental Cap. ...	119—124	+8
223,130	July 18	3½	3½	Do. 3½ p.c. Red. Deb. ...	87—92	...
235,242	Aug. 8	8½	8½	Lea Bridge 5 p.c. Ord. ...	160—165	...
63,480	Dec. 19	3	3	Maidstone 3 p.c. Deb. ...	69—74*	...
45,000	Nov. 21	†10	†10	Malta & Mediterranean ...	130—135	...
				Metropolitan (of Melbourne)		
392,000	Oct. 3	5½	5½	5½ p.c. Red. Deb. ...	100—105	...
231,977	Aug. 22	5	5	M.S. Utility 'C' Cons. ...	99—104	...
968,658	,,	4	4	Do. 4 p.c. Cons. Pref. ...	95—100	...
390,076	Dec. 19	4	4	M.S. Utility 4 p.c. Deb. ...	95—100*	+2
148,955	,,	5	5	Do. 5 p.c. Deb. ...	112—117*	...
125,000	Jan. 3	3½	3½	Do. 3½ p.c. Red. Bds.	94—97*	—1
675,000	Nov. 21	†6	†6	Montevideo, Ltd.	72—77	+2
250,000	Aug. 8	7½	7½	North Middlesex 6 p.c. Con.	142—147	...
396,160	Aug. 8	5	5	Northampton 5 p.c. max. ...	105—110	...
300,000	Oct. 24	†7	†9	Oriental, Ltd.	145—150	...
468,537	Dec. 5	8	7⅔	Plymouth & Stonehouse 5 p.c.	130—140	—5
621,667	Aug. 8	8½	8½	Portsmouth & Gosport Cons.	157—162	...
241,446	,,	5	5	Do. 5 p.c. max. ...	100—105	...
73,350	,,	5	5	Do. 5 p.c. Pref. ...	107—112	...
75,000	,,	4	4	Do. 4 p.c. Pref. ...	90—95	...
114,000	Aug. 8	5	5	Preston 5 p.c. Pref.	105—110	...
247,966	Dec. 19	4	4	Primitiva 4 p.c. Cons. Deb. ...	96—101*	...
625,959	July 18	4	4	Do. 4 p.c. Red. Deb. ...	94—99	...
15,000	Sept. 5	6	6	San Paulo 6 p.c. Cum. Pref. ...	8½—9	...
441,275	Sept. 19	1/1⅛	1/1⅛	Severn Val. Gas Cor. Ld. Ord.	20/6—22/6	...
460,810	Sept. 19	-/10⅛	-/10⅛	,, ,, 4½ p.c. Cum. Pref.	19/6—21/6	...
133,201	Aug. 22	5	8⅛	Shrewsbury 5 p.c. Ord. ...	143—148	...
9,000	June 3	4	‡4	South African Ord.	4½—5½	...
1,371,752	Aug. 22	1/2⅜	1/2⅜	South East'n Gas Cn. Ld. Ord.	21/—23/-	...
871,636	,,	-/10⅝	-/10⅝	Do. 4½ p.c. Red. Cum. Pref.	19/—21/-	...
498,818	,,	4	4	Do. 4 p.c. Cum. Pref. ...	18/—20/-	...
450,000	Aug. 8	4	4	Do. 4 p.c. Deb.	99—102	...
150,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	94—97	...
6,709,895	Aug. 8	6	5	South Met. Ord.	103—106	...
1,135,812	,,	6	6	Do. 6 p.c. Irred. Pref. ...	128—133	...
850,000	,,	4	4	Do. 4 p.c. Irred. Pref. ...	95—100	...
1,895,445	Dec. 19	3	3	Do. 3 p.c. Deb.	74—79*	...
1,000,000	July 4	5	5	Do. 5 p.c. Red. Deb. ...	107—112	...
600,000	,,	—	§31/-	Do. 3½ p.c. Red. Deb. ...	97—102	...
1,543,795	Aug. 8	6	6	South Suburban Ord. 5 p.c. ...	113—118	...
512,825	,,	5	5	Do. 5 p.c. Pref.	108—113	...
500,000	,,	4	4	Do. 4 p.c. Pref.	95—100	...
250,000	,,	3¾	3¾	Do. 3¾ p.c. Red. Pref. ...	92—97	...
888,587	Dec. 5	5	5	Do. 5 p.c. Deb.	113—118	...
250,000	,,	4	4	Do. 4 p.c. Deb.	95—100	...
200,000	Aug. 8	3½	3½	Do. 3½ p.c. Red. Deb. ...	94—99	...
427,859	Sept. 19	8	9⅛	S. Western Gas & Water Ord.	16/—18/-	...
160,523	Oct. 10	-/10⅛	-/10⅛	Do. 4½ p.c. Red. Cum. Pf.	19/—21/-	...
110,000	Dec. 19	4	4	Do. 4 p.c. Red. Deb. ...	93—98*	...
750,541	Aug. 8	5½	5	Southampton Ord. 5 p.c. ...	105—110	...
148,836	Dec. 19	4	4	Do. 4 p.c. Deb. ...	93—98*	...
350,000	Aug. 8	5½	5½	Swansea 5½ p.c. Red. Pref. ...	105—110	...
200,000	Dec. 19	3½	3½	Do. 3½ p.c. Red. Deb. ...	92—97*	...
1,076,490	Aug. 8	6⅔	6⅔	Tottenham and District Ord.	125—130	...
409,835	,,	5½	5½	Do. 5½ p.c. Pref.	116—121	...
62,235	,,	5	5	Do. 5 p.c. Pref.	108—113	...
334,615	Dec. 5	4	4	Do. 4 p.c. Deb.	95—100	...
85,701	Nov. 21	6	6	Tuscan 6 p.c. Red. Deb. ...	95—100	...
1,131,550	Aug. 22	6	4	U. Kingdom Gas Cor. Ord. ...	17/6—19/6	...
1,051,280	Nov. 7	4⅓	4⅓	Do. 4½ p.c. 1st Cum. Pref.	19/—21/-	...
762,241	,,	4	4	Do. 4 p.c. 1st Red. Cum. Pf.	19/—21/-	...
745,263	Dec. 19	4⅓	4⅓	Do. 4½ p.c. 2nd Non-Cum. Pf.	15/6—17/6*	...
1,066,186	Sept. 5	3⅓	3⅓	Do. 3½ p.c. Red. Deb. ...	95—98	...
375,689	Aug. 8	7	7	Uxbridge, &c., 5 p.c.	125—130	...
133,010	,,	5	5	Do. 5 p.c. Pref. ...	108—113	...
1,371,138	Aug. 8	7	7	Wandsworth Consolidated ...	136—141	...
2,525,768	,,	4	4	Do. 4 p.c. Pref.	95—100	...
1,343,964	Dec. 19	5	5	Do. 5 p.c. Deb. ...	113—118*	...
383,745	,,	4	4	Do. 4 p.c. Deb. ...	95—100*	...
400,000	,,	§25/-	3⅜	Do. 3⅜ p.c. Red. Deb. ...	96—101*	...
558,342	Aug. 8	7	6⅞	Watford and St. Albans Ord.	128—133	...
200,000	,,	5	5	Do. 5 p.c. Pref. ...	107—112	...
200,000	,,	5½	5½	Do. 5½ p.c. Pref. ...	113—118	...
200,000	,,	—	16/8§	Do. 4 p.c. Red. Pref. ...	95—100	...
200,000	Dec. 19	4	4	Do. 4 p.c. Red. Deb. ...	95—100*	...
200,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	92—97*	...

a.—The quoration is per £1 of stock. * Ex. div. † Paid free of income-tax. ‡ For year. § Actual.

Supplementary List and Provincial Exchanges overleaf.

STOCK AND SHARE LIST—Cont.

Supplementary List, not Officially Quoted, London

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Nominal Quotations Jan. 6.	Rise or Fall on Week.
202,152	Sept. 5	5	5	Ascot Ord.	101—106	...
128,182	Dec. 19	5	5	Do. 5 p.c. Pref.	107—112*	...
31,035	Aug. 22	–/4½	–/4½	Associated Utilities 4 p.c. Pref.	16/—18/–	...
100,000	Dec. 19	3⅛	3⅛	Do. 3⅛ p.c. Red. Deb. ...	95—100*	...
17,000	Aug. 22	8	8	Bognor Orig. Ord. 'A' ...	155—165	...
62,210	,,	8	8	Do. New Addl. 'A' ...	155—165	...
87,160	,,	7	7	Do. New 7 p.c. max. ...	145—155	...
37,440	Aug. 8	10	10	Cam. Univ. & Town 10 p.c. max.	188—198	...
125,970	,,	7	7	Do. 7 p.c. max.	133—138	...
39,025	,,	5	5	Do. 5 p.c. max.	97—102	...
96,410	July 18	4½	4½	Cardiff 4½ p.c. Pref.	95—100	...
150,000	Aug. 8	4	4	Croydon 4 p.c. Pref.	97—100	...
130,000	Dec. 19	4	4	Do. 4 p.c. Deb.	95—100*	...
65,000	Aug. 8	8⅛	7⅛	Eastbourne 'A' 5 p.c. ...	140—145	...
198,000	,,	7	6	Do. 'B' 3½ p.c.	114—119	...
112,312	,,	5	5	Do. 5 p.c. Pref.	107—112	...
130,000	Dec. 19	5	5	Do. 5 p.c. Deb.	110—115*	...
24,000	Aug. 8	8⅛	8⅛	Great Yarmouth 8⅛ p.c. max.	43—48	...
59,400	,,	7⅛	7⅛	Do. 7⅛ p.c. max.	33—38	...
51,160	Dec. 5	5⅛	5⅛	Do. 5⅛ p.c. Deb.	120—125	...
152,600	Sept. 5	9	8	Guildford Cons.	163—168	...
54,055	,,	5	5	Do. 5 p.c. Pref.	107—112	...
68,250	Dec. 19	5	5	Do. 5 p.c. Deb.	110—115*	...
156,600	Aug. 22	7¼	7¼	Hampton Court Cons. ...	126—131	...
80,000	Aug. 8	4	4	Lea Bridge 4 p.c. Pref. ...	90—95	...
60,000	,,	6	6	Do. 6 p.c. Pref.	121—126	...
94,876	Dec. 5	4	4	Do. 4 p.c. Deb.	94—99	...
73,620	Sept. 5	8¾	8¾	Luton Cons. 'A'	153—163	...
107,960	Sept. 19	5½	4	Mid Kent Ord.	8⅛—9⅛	...
230,940	Aug. 8	10	10	Oxford & District Ord. ...	195—200	...
47,112	,,	5	5	Do. 5 p.c. Pref.	106—111	...
50,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	107—112	...
126,193	Nov. 7	7½	7½	Peterborough Ord.	137—142	...
64,990	Sept. 5	6½	7½	Redditch Ord....	118—128	...
166,850	Aug. 8	8	8	Romford Ord....	142—147	...
60,000	,,	4	4	Do. 4 p.c. Pref.	99—103	...
44,000	Sept. 19	5	5	Do. 5 p.c. Deb.	112—117	...
25,570	Aug. 8	5½	5½	Rugby 5½ p.c. Pref.	120—125	...
25,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	104—109	...
42,750	Dec. 5	5½	5½	Do. 5½ p.c. Deb.	117—122	...
110,950	Aug. 22	8	8	Ryde Ord.	140—150	...
270,086	Sept. 5	7	7	Slough Ord.	128—133	...
21,000	Dec. 19	5	5	Do. 5 p.c. Deb.	108—113*	...
28,872	Nov. 7	5½	5½	S. Midland Gas Cpn. Ltd. Ord.	17/—19/–	...
28,866	Sept. 5	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	17/—19/–	...
117,228	Aug. 8	7	5	Swindon Cons.	102—107	...
60,425	Dec. 5	5	5	Do. 5 p.c. Deb.	110—115	...
64,380	Dec. 19	5	5	Torquay & Paignton 5 p.c. Pref.	105—110*	...
130,000	Aug. 8	8	5	Wakefield Ord.	116—121	...
81,650	,,	5	5	Do. 5 p.c. max.	100—105	...
82,000	Aug. 8	6	6	Weymouth Ord.	103—108	...
98,384	Aug. 22	6	6	Wolverhampton 6 p.c. Pref.	118—123	...
160,000	Dec. 19	5½	5½	Do. 5½ p.c. Rd. Db.	103—108*	...
90,000	Dec. 19	5	5	York 5 p.c. Red. Deb. ...	103—108*	...
133,640	July 18	6¼	6¼	Yorktown (Cam.) 5 p.c. Cons.	118—123	...
120,000	,,	5	5	Do. 5 p.c. Pref.	105—110	...
35,000	Dec. 5	5⅛	5⅛	Do. 5⅛ p.c. Deb.	120—125	...

BRISTOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Jan. 6.	Rise or Fall on Week.
347,756	July 18	6	5	Bath Cons.	117—119	...
1,667,250	July 18	5	5	Bristol, 5 p.c. max.	111—113	...
120,420	Dec. 19	4	4	Do. 1st 4 p.c. Deb. ...	98—101*	...
217,870	,,	4	4	Do. 2nd 4 p.c. Deb. ...	98—101*	...
328,790	,,	5	5	Do. 5 p.c. Deb.	117—120*	...
274,000	Aug. 8	5	5	Newport (Mon.) 5 p.c. max. ...	97—99	...
13,200	Sept. 19	8⅞	7	Pontyp'l Gas & W. 10 p.c. 'A'	12⅞—13⅞	...
13,600	,,	6	5	Do. 7 p.c. 'B' ...	11⅛—12⅛	...
40,000	,,	6	5	Do. 7 p.c. 'C' ...	11⅛—12⅛	...
140,778	Aug. 8	5	5	Weston-super-Mare Cons. ...	106—108	...
64,338	Dec. 19	4	4	Do. 4 p.c. Deb. ...	98—101*	...
33,340	,,	7⅛	7⅛	Do. 7⅛ p.c. Deb. ...	149—152*	...

LIVERPOOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Jan. 6.	Rise or Fall on Week.
157,150	Aug. 8	6½	5	Chester 5 p.c. Ord.	109—111	...
92,500	Dec. 19	4	4	Do. 4 p.c. Pref.	95—99*	...
36,430	,,	3½	3½	Do. 3½ p.c. Deb.	87—90*	...
41,890	,,	4	4	Do. 4 p.c. Red. Deb. ...	97—101*	...
2,167,410	Aug. 22	6	6	Liverpool 5 p.c. Ord.... ...	122—124	...
245,500	Dec. 19	5	5	Do. 5 p.c. Red. Pref. ...	100—105*	...
306,083	July 18	4	4	Do. 4 p.c. Deb.... ...	100—102	...
106,280	Aug. 8	10	10	Preston 'A' 10 p.c.	198—208	...
188,219	,,	7	7	Do. 'B' 7 p.c.	131—141	...

NEWCASTLE EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Jan. 6.	Rise or Fall on Week.
122,577	Aug. 8	8	8	Blyth 5 p.c. Ord.	160—162	...
732,000	Aug. 22	5	5	Hartlepool G. & W. Cn. & New	89½—90½	...
2,061,315	Aug. 8	5⅜	5	Newcastle & Gateshead Con.	22/9—23/3o	...
682,856	,,	4	4	Do. 4 p.c. Pref. ...	100—101	...
776,706	Dec. 19	3½	3½	Do. 3½ p.c. Deb. ...	87½—88½*	...
277,285	Oct. 24	5	5	Do. 5 p.c. Deb. '43 ...	103¼—105¼	...
332,351	Aug. 22	6	6	Sunderland 6 p.c. max. ...	135—137	...

NOTTINGHAM EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Jan. 6.	Rise or Fall on Week.
542,270	Aug. 8	9	6	Derby Con.	133—138	...
55,000	Dec. 19	4	4	Do. 4 p.c. Deb.	100—105	...
20,000	Dec. 19	5	5	Long Eaton 5 p.c. Pref. ...	10—12	...
80,000	,,	5	5	Do. 5 p.c. Deb. ...	105—110	...

SHEFFIELD EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Jan. 6.	Rise or Fall on Week.
10,000	Aug. 8	10	10	Great Grimsby 'A' Ord. ...	205—215	...
6,500	,,	10	10	Do. 'B' Ord. ...	205—215	...
79,000	,,	10	10	Do. 'C' Ord. ...	195—205	...
1,806,339	Aug. 22	6½	6½	Sheffield Cons.	139—141	...
95,000	Dec. 19	4	4	Do. 4 p.c. Deb.	100—102*	...

a The quotation is per £1 of Stock. * Ex div.

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